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TRADE OF THE NETHERLANDS

BY

PROF. DR. H. BLINK, OF THE HAGUE.

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TRADE OF THE NETHERLANDS

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PROF. DR. H. BLINK, OF THE HAGUE.

GENERAL INTRODUCTION.

The natural condition of the soil in different parts of the world and the industry of the inhabitants are the chief factors in the computation of their degree of importance with regard to the production and consumption of commodities. The difference between production and consumption in the several countries led to export and import in order to redress this economic inequality. The process of interchange of commodities has often revolved on nations, whose geographical position made them particularly adapted for carrying on trade.

Hence a country's trade in goods originates principally from the following circumstances: 1) From the production of commodities by a country yielding the raw material for them. 2) From the consumption of goods either fitted for immediate use or to serve as raw material for some industry. In the latter case the country of consumption again becomes one of production. 3) From the interference of a nation by trade and traffic to carry the products from a country of origin to one of consumption.

These three forms of the economic process for bringing the commodities to the disposal of mankind, do not usually appear separately, but generally mixed. Most countries are both producers and consumers and at the same time commercial, and a producing business is generally consuming and mercantile as well. But usually one of these forms predominates in every country.

In The Netherlands the three forms of industry above mentioned are all practiced. Owing to this country's economic-geographical position, however, trade and traffic occupy a first place, and make her above all a region of commerce



The "Maashaven," Rotterdam.

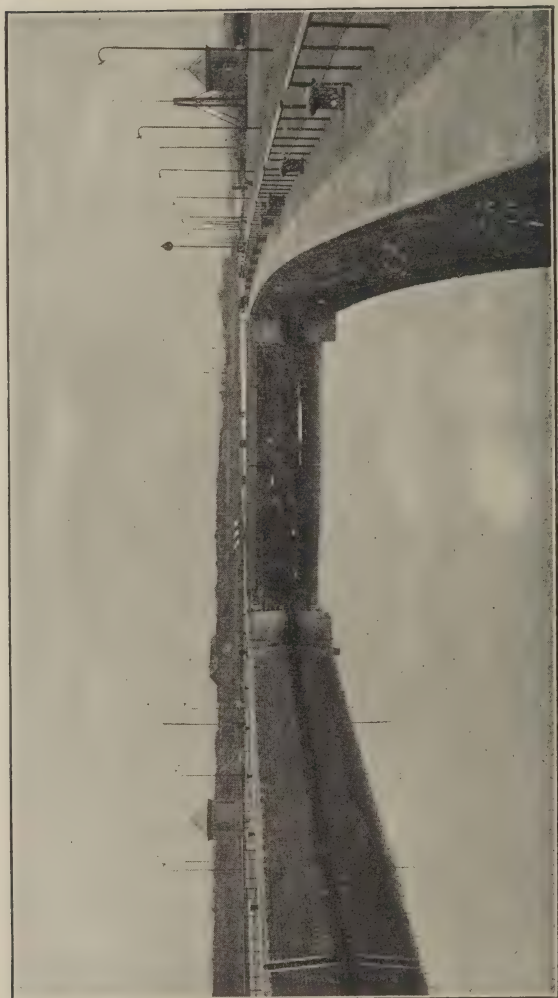
and navigation. This is confirmed by the census of 1909, which divides the population as under:

Employments.	Employees	Percentage of total
Manufacture	790,137	34.9
Agriculture	618,121	27.3
Trade and traffic.....	442,010	19.6
Chase and fishery	23,972	1.1
Other employments....	386,995	17.1
Total	2,261,235	100.—

Of the total population of The Netherlands, amounting to 5,8 million persons, 2,261,235 were in 1909 occupied in the different manual employments. The manufacture group contains the greatest number of hands, nearly 35 per cent of the artisans; then follows agriculture with a good 27 per cent, and then trade and traffic with 19.6 per cent.

Though by percentage trade has the lowest figure of hands employed in Netherlands industries, a comparison with other countries shows that in this country commercial traffic occupies a prominent place. The following table shows the percentage of the total of hands employed in manual industries as compared with other countries:

	YEAR	Manufacture. Percentage.	Agriculture and Fishery. Percentage.	Trade and Traffic Percentage
Un. St. of America	1900	24.1	35.9	16.3
England and Wales	1901	48.0	8.8	23.0
Scotland	1900	50.3	12.6	21.5
Ireland	1901	25.2	44.7	8.1
Germany	1907	40.0	35.2	12.4
Belgium	1900	41.6	21.1	11.7
Denmark	1901	25.2	48.2	11.8
The Netherlands	1909	34.6	28.3	19.6



Great lock at Ymuyden.

The figures show that only in England with Wales and in Scotland is the percentage of hands employed in trade and traffic higher than in The Netherlands. Hence it follows that this country is above all a commercial one, while in its trade and traffic that in goods takes a considerable share, though that in stocks and money is also of great importance.

The goods trade of The Netherlands has largely increased in the last half century, as will appear from the following table:

	Import In million Dollars. Special trade	Export. In million Dollars Special trade.	Total turnover In million Dollars.
	Averages		
1847-1851	73.6	86.0	159.6
1852-1856	96.0	120.4	216.4
1857-1861	124.4	145.6	270
1862-1866	151.2	161.2	312.4
1867-1871	197.2	209.6	406.8
1872-1876	272.4	206.4	478.8
1877-1881	333.6	240.4	574
1882-1886	430.8	329.2	760
1887-1891	504.8	434.4	939.2
1892-1896	578.4	470.8	1049.2
1897-1901	754.8	640.4	1395.2
1902-1906	958	787.6	1745.6
1907-1911	1220	976.8	2196.8
1912	1445.2	1245.2	2690.4
1913	1566.8	1232.8	2799.6

Though The Netherlands only occupy 0.3 per cent of the area of Europe and the population is only 1.3 per cent of that of Europe, the trade turnover of this country amounted in 1912 to 11.2 per cent of that of all the European countries together and to 6.8 per cent of the world's trade, while Great Britain shared in the latter to the extent of 16.9 per cent, Germany 12 per cent and the United States of America to the extent of 9.5 per cent.



A steamer leaving the outer harbor of Ymuyden.

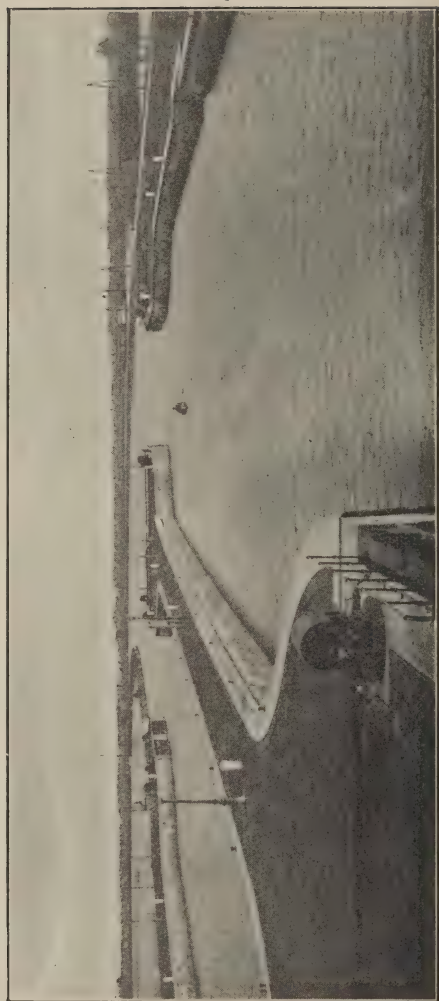
In consequence of the geographical position of The Netherlands, its goods trade goes principally by water. In 1912 33.9 per cent of the foreign trade passed by sea, 49.5 per cent by river and canal (the Rhine taking the larger part) and 16.5 per cent by land (railway, &c.). The ports of Rotterdam and Amsterdam are foremost as regards the foreign trade; then follow the ports of Flushing, Zaandam, Harlingen and Delfzyl. the arrivals in The Netherlands in 1913 numbered 14,952 vessels, measuring 17,143,816 tons net, whilst departures numbered 11,878 measuring 11,020,848 tons net.

The following table shows the principal countries and Colonies with which the Netherlands trade, the figures being those of the special trade for 1913:

	Import		Export	
	In million Dollars	Percentage of total	In million Dollars.	Percentage of total.
Germany	455.4	29.0	591.1	47.9
Netherlands Indies	211.4	13.5	65.1	5.3
United States of America	177.1	11.3	52.5	4.3
Great Britain a. Ireland	136.3	8.7	273.5	21.4
Belgium	140.8	9.0	135.9	11.0
Russia.....	146.4	9.3	12.3	1.0
British India.....	40	2.6	3.3	—

In the foregoing statement the exports and imports of the different countries do not vary in the same proportion. Germany stands highest in both cases, but in the case of exports from The Netherlands, Great Britain and Belgium follow next, though both take a lower place with regard to imports. The United States rank third as regards imports, but fifth in regard to exports from this country. This is due to the Netherlands drawing goods from the United States mainly for consumption.

The articles of The Netherlands' international goods-trade are, by their origin, to be divided in the same three groups as mentioned on page 5.



Locks at the entrance of the Merwede-canal near Amsterdam.

1) Products yielded by the country :

(a) by agriculture, and

(b) by manufacture.

2) Foreign commodities, bought and sold here.

3) Foreign articles of consumption for home use.

Group 3 is for the greatest part comprised in group 2 and is for that reason not separately returned in the statistics. Each of these groups has a particular economic importance for The Netherlands.

As an illustration of the above especially as far as regards groups 2 and 3 a statement of the principal general commodities is added as appendix I to this pamphlet.

HOME PRODUCE.

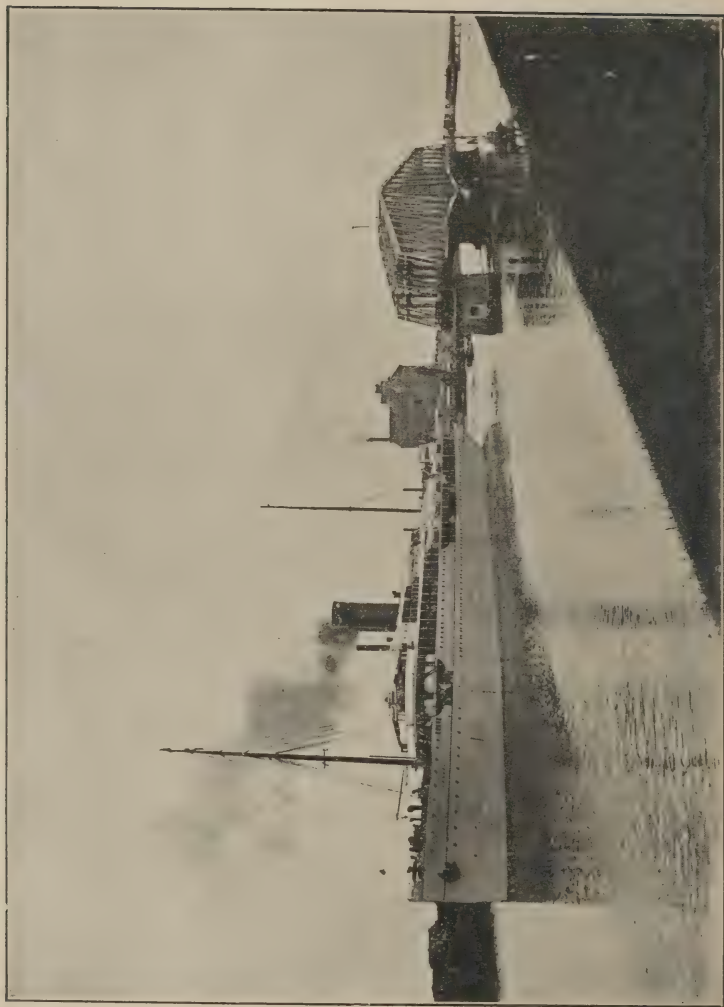
A. TRADE IN AGRICULTURAL PRODUCTS.

After Belgium The Netherlands has the densest population of all European countries, namely, 179 inhabitants per square kilometre, or 4 per acre ; but while 42 per cent of the area of Belgium is arable land and 27 per cent pasture, only 27 per cent of the area of The Netherlands is under tillage and 37 per cent fit for grazing. In Germany 16 per cent of the area is pasture and 48 per cent arable ; in France 10 per cent and 56 per cent, respectively ; and in Great Britain, 51 and 25 per cent.

These figures show that The Netherlands and Great Britain both have only a small area of arable land with a dense population. This prevents The Netherlands producing on any large scale crops for the world's trade. There is always a great deficiency of cereals in this country.

Agriculture has turned mainly to more special produce, for which the soil and the climate of the country are particularly fit and to more elaborate cultures, principally the growing of vegetables, partly for exportation. The comparatively large extent of pasture land and the fine quality of the grass, have turned The Netherlands into a region of intensive cattle rearing, which industry supplies the main part of the articles for export.

The following statement shows the principal products of Netherlands agriculture and the countries whither exported.



A great mail-steamer passing the railway-bridge near Velzen.

A. Statement of trade in Netherlands agricultural produce.

ARTICLES.	Import	Export	Excess Export	Principal destinations of Exports in tons of 2,240 lbs.	
	In tons of 2,240 lbs.				
Potatoes	54,540	415,817	361,277	Germany 155,196 Belgium 97,573	Gr. Britain 132,114 Un. States 17,413
Beetroots	46,324	287,919	241,595	Belgium 283,058	Germany 4,845
Flax	717	32,461	31,744	Belgium 29,382 Un. States 345	Germany 737
Green vegetables	20,444	221,016	200,572	Germany 133,891 Belgium 20,971	Gr. Britain 63,672
Fruit (fresh)	37,443	52,746	15,303	Germany 38,460 Belgium 2,164	Gr. Britain 11,974
Beans and pease	152,479	81,339	— 71,140	Belgium 14,503 Germany 44,753	Gr. Britain 11,205
Flower-bulbs	2,185	24,997	22,812	Gr. Britain 10,058 Germany 5,204	Un. States 5,414 Sweden 1,140
Plants, trees and shrubs....	2,870	14,724	11,854	Germany 7,740 Gr. Britain 1,666	Un. States 3,797
Cattle (no of heads)	1,309	59,506	58,197	Belgium 52,076	Germany 6,581
Butter	2,508	37,060	34,552	Germany 19,041 Gr. Britain 7,940	Belgium 8,424 Neth Indies 1,197
Cheese	282	65,925	65,643	Gr. Britain 19,118 Germany 16,096	Belgium 16,719 France 4,129
Pigs (no. of heads).....	854	36,399	35,545	Un. States 3,322	Germany 780
Sheep and lambs (no. of heads)	75	85,605	85,530	Belgium 35,313	Germany 8,045
Horses (no of heads).....	19,931	22,416	2,485	Germany 13,626	Belgium 9,923
Beef and veal (fresh).....	3,363	18,293	14,930	Gr. Britain 7,528	Germany 10,313
Pork (fresh)	46	35,885	35,839	Gr. Britain 25,229	Germany 10,313
Pork and bacon (salted)	84	9,196	9,112	Gr. Britain 8,526	Gr. Britain 5,778
Eggs	163,44	23,104	6,760	Germany 15,326 Belgium 1,990	



The "Haringvliet" at Rotterdam.

AGRICULTURE IN GENERAL.

The above statement shows that The Netherlands principally produce for export articles of agriculture, viz. potatoes, beetroot, flax, pulse, flower-bulbs, plants and shrubs, fruits and vegetables.

Further, cattle-breeding supplies for export cattle, pigs, sheep, horses, butter, cheese and eggs.

There are many more products of agriculture partially exported, but as they are imported in a much greater quantity they are not mentioned here.

1. *Potatoes.* Potatoes are grown for export on a very large scale. The excess of export over import, viz. 361,277 tons, goes mainly to Germany, but great quantities also go to Great Britain, Belgium and even to the United States, Cuba, Netherlands Guyana and Portugal. The trade in potatoes, however, is subject to great fluctuations, depending on the success of the crop and the requirements of the different countries.

2. *Beetroots.* Beetroots, the raw material for the sugar industry, are mainly exported to Belgium and Germany.

3. *Flax.* The export of flax is still pretty important; it is hardly spun here any more, but goes principally to Belgium and France, and also to Germany, Great Britain and Ireland.

4. *Pulse.* Pulse are at the same time products of the Netherlands soil and pure commodities. The home crop of beans amounted in 1913 to 37,812 tons. Of beans and vetches there were imported in that year 32,033 tons, mainly from Germany, Russia and Belgium, and exported 28,847 tons, mostly to Germany and Belgium, so that about 3,186 tons more were imported than exported.

Of pease the home production in 1913 amounted to 41,950 tons. The import amounted to 120,446 tons, principally from Germany, Russia and British India, while the export amounted to 52,492 tons, mostly to Germany and Great Britain. Thus a balance of 67,954 tons was left for home use. Consequently The Netherlands do not supply sufficient pulse for home requirements.



The "Waalhaven," Rotterdam,

GARDEN PRODUCTS IN GENERAL.

Horticulture has been famous in The Netherlands for ages. As early as the 16th century it attracted the attention of foreigners. The royal houses of Denmark and England not only ordered vegetables here for grand festivities, but also engaged Netherlands gardeners to introduce horticulture in their countries. The cultivation of fruit in this country also bore a good name at that time. The large scale cultivation for export only began after 1877. In consequence of the crisis which at that time bore down agriculture by low prices of cereals, horticulture was largely extended, under scientific guidance from the side of the Government, and this extension has proceeded on an increasing scale of late years. In 1904 horticulture occupied in all 180,578 acres, in 1913 203,650 acres. In addition to this, the mode of cultivation has been greatly improved by the construction of large hothouses, tending to expand and quicken the growth, with or without artificial warmth. Originally the hothouses were introduced to cultivate plants growing in hot climates, but for some ten years past or a little longer they have been pretty well generally used to enhance mercantile production. The first tomato and cucumber forcing houses were built about 1903, and of late years hothouses have been constructed for the cultivation of sundry vegetables like: spinage, lettuce, cauliflower, tomatoes, beans, &c., either side by side or in succession.

In 1912 the area covered by these hothouses in The Netherlands amounted to 557 acres. Of these 264 were occupied by vegetables, 205 by fruit, 3,7 by trees and 84 acres by flowers.

Besides the cultivation in these large hothouses, there is another under flat hotbeds, which in 1912 covered an area of 1,193 acres planted with vegetables, 98 acres with fruit trees, 156 acres with trees and 30 acres with flowers, making together 1,477 acres.

The introduction of these hothouses and beds has largely intensified horticulture, so that the production augmented in a much larger ratio, at least two or three times more, than the area appropriated. By this means The Netherlands



Bonded stores at Rotterdam.

have become one of the principal countries for the supply of garden products for commercial purposes.

Horticulture may be divided into :

1) the cultivation of vegetables; 2) of fruit; 3) of trees and shrubs; 4) of flower-bulbs; and 5) of flowers.

THE CULTIVATION OF VEGETABLES.

Since 1870 the growth of vegetables has gained an international importance in this country, in consequence of the improvement of the means of conveyance. especially the railways, which enabled the merchants to send the products of the field over long distances. The development of the large towns and of industrial centres greatly increased the demand for vegetables.

The area of gardenland, in 1880 amounting to only 11,093 acres, had grown in 1913 to 45,208 acres, but the yield was augmented much faster by the cultivation under glass. The export of fresh and dried vegetables increased considerably, as is shown by the following export figures for those commodities :

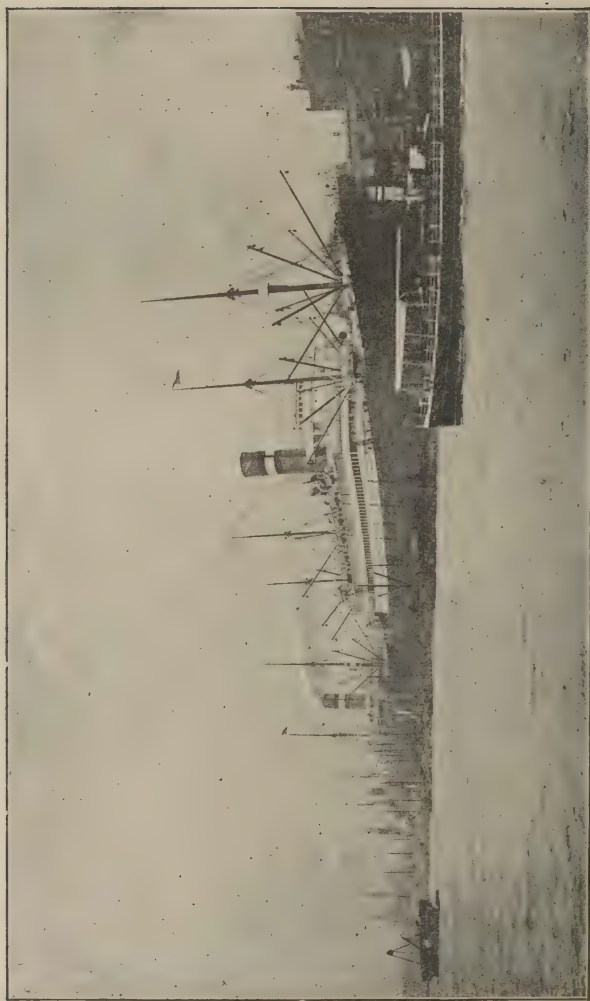
1877—1886.....	43,000 tons (yearly average)
1887—1896.....	68,000 " " "
1897—1906.....	137,000 " " "
1913	221,348 " " "

The fresh vegetables alone had in 1913 an excess of export of 200,572 tons, the countries of destination being: Germany, Great Britain and Belgium. The exports consisted mainly of: cabbages, cucumbers, tomatoes, onions, early potatoes and asparagus.

FRUITS.

The cultivation of fruit in The Netherlands has been largely extended, the principal kinds being apples, pears, cherries, black and red currants and strawberries, of which there were exported in all 43,918 tons to Germany, Great Britain and Belgium (in order of quantities taken).

As against this there is a considerable import of fruit, in all 37 million K.G., of apples from Belgium and the United States, of oranges from Spain and California, lemons from Italy, bananas from Central America and Surinam, &c.



Steamers and buildings of the Holland-America Line at Rotterdam.

Imports for consumption were as follows :

Apples.....	2,006 tons.
Oranges	23,988 „
Lemons	2,863 „

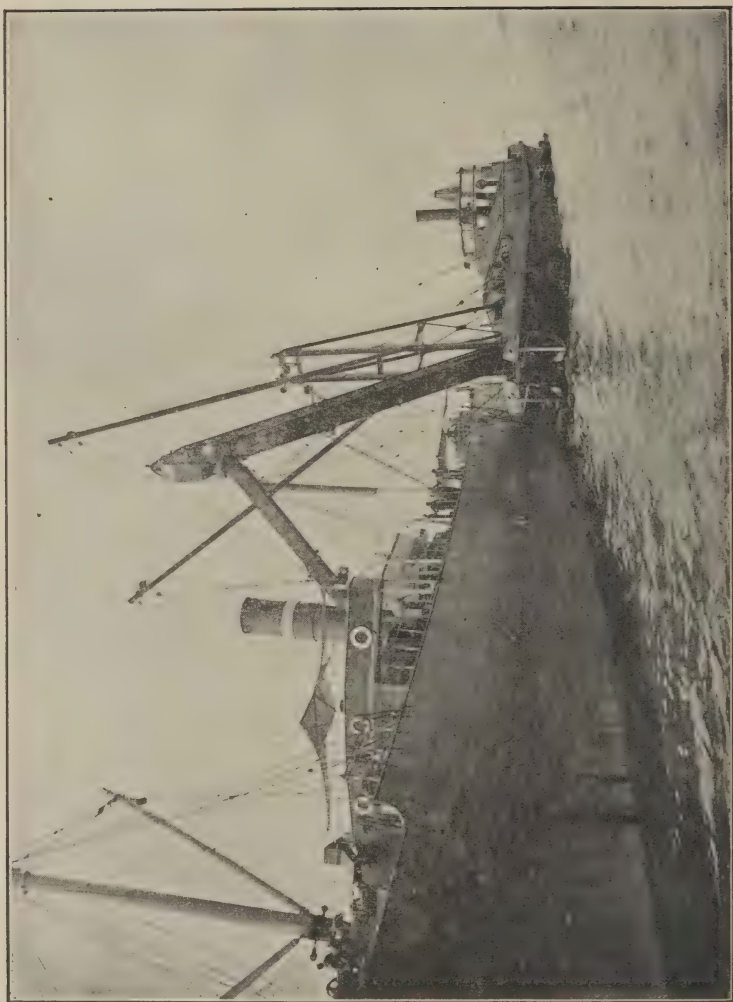
BULBS.

The flower bulbs are a special product of The Netherlands, which in 1890 covered an area of 3,808 acres and in 1913 of 13,368 acres.

As early as the 16th century Holland was known for her many flowers and rare plants, and in the beginning of the 17th century the tulip, imported in Europe via Turkey, became a well-known object of cultivation. In 1635—1637 the tulips became a famous commodity in consequence of gigantic speculation, and a century later, 1733—1734, Holland was smitten by a similar, though less extensive infection, by speculation in hyacinths. Yet bulb-growing remained very limited till some thirty years ago, and only since that time has it been widely developed. The climate, the soil and a thorough acquaintance with the cultivation based on centuries of experience which have converted the culture into a real science, all cooperated in promoting bulb-growing in this country, and an adequate commercial spirit on the part of the planters have made the bulbs into an article of the world's trade. They are exported in larger quantities to Great Britain, the United States, Belgium and many more countries.

PLANTS, TREES AND SHRUBS.

The cultivation of trees and shrubs occupies some important centres in The Netherlands, viz. : Boskoop, Aalsmeer, Naarden, Bussum and Oudembosch, besides some smaller ones. Boskoop and Aalsmeer especially cultivate for export. Here are principally grown the so-called "closeplants", i e., plants packed for transport, with a lump of soil between the roots, like : conifera, hollies, lilacs, rhododendrons, azaleas; and in Boskoop the cultivation of roses is next in importance. Of late years the trade in these plants has spread over all the world. The export of these plants is mainly directed to



Transshipping at Rotterdam.

Germany, but also includes the United States and Great Britain in the west and Russia in the east.

THE CULTIVATION OF FLOWERS.

This branch of cultivation occupies 1,153 acres of ground, of which 83 acres are covered by hothouses and 45 acres by hotbeds. The principal centre of flower-growing is Aalsmeer. The export of products of this cultivation in 1913 amounted to 1,223 tons, mainly to Germany.

PRODUCTS OF CATTLE-BREEDING.

The products which cattle-growing supplies to trade are: butter, cheese, meat and pork, cattle, pigs, sheep and horses

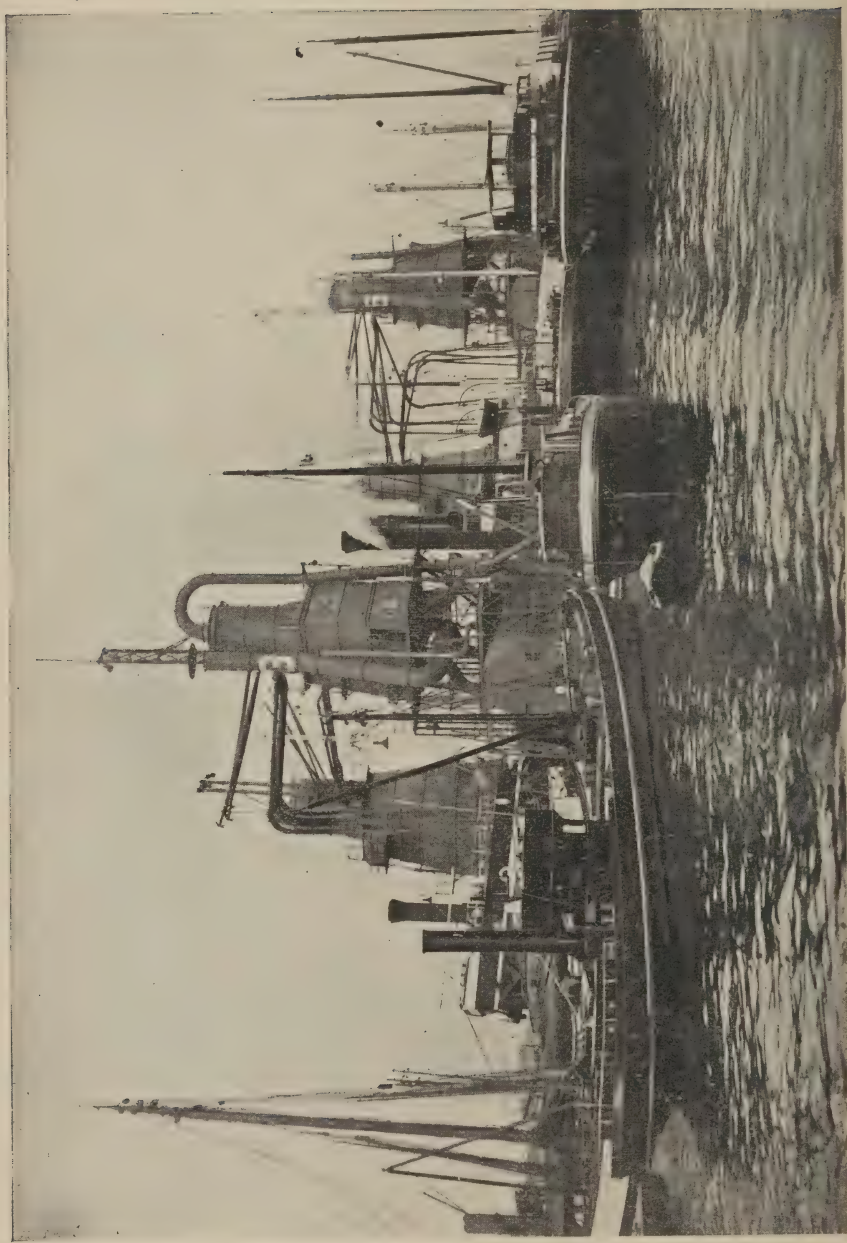
BUTTER AND CHEESE.

These have been from time immemorial the principal products of farming in The Netherlands, that were being sent abroad before the 16th century. The export of butter was in the 19th century principally directed to Great Britain, until the seventies; after 1880 this export continually decreased and was replaced by an import of Danish butter, while the Netherlands butter was directed to other countries, in the first place to Germany and further to Belgium, the Netherlands East Indies and other countries.

It was about this time also, after 1877, that the reform in butter making occurred, the hand churn being replaced by steam machinery. In 1912 there were at work in this country 630 steam butterworks, 421 of which worked co-operatively, and 327 hand power factories. These works produced in 1912 about 50,323 tons of butter, while 16,875 tons were made on farms, making a total of 67,198 tons. Of this quantity 39,149 tons were exported in that year. In 1913 the total export of butter amounted to 37,060 tons, of which 19,041 tons went to Germany, 8,424 tons to Belgium, 7,940 tons to Great Britain and 1,197 tons to the Netherlands East Indies.

CHEESE.

Cheese more fit for distant transport has always had a wider range of export. The production of cheese was also



Grain elevator at Rotterdam.

transferred for a great part from the farms to factories after 1877. In 1912 there were at work in this country 310 cheese factories, including 219 on the co-operative system. The production of cheese amounted in 1912 to nearly 51,790 tons on the farms, and 43,920 in the factories, or together 95,710 tons, of which 59,470 tons were exported. The export of cheese in 1913 amounted in all to 65,925 tons and was directed (in order of quantities) to Great Britain, Belgium, Germany, France, the United States and other countries.

CATTLE, PIGS, SHEEP, MEAT.

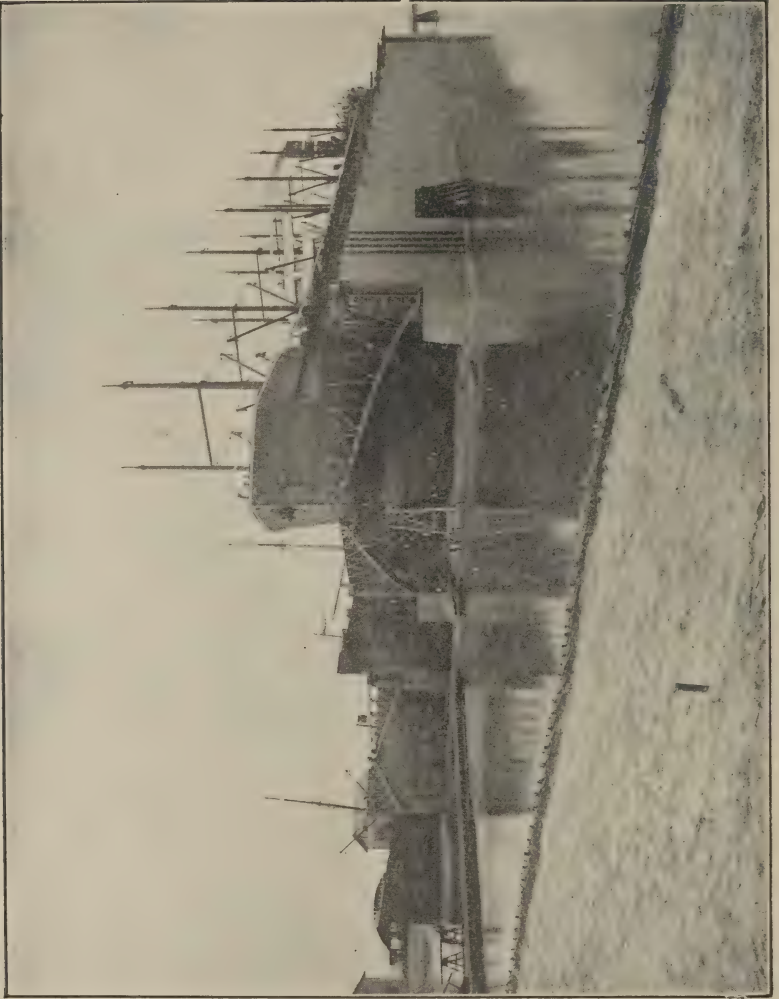
The import of cattle in Germany and Great Britain from The Netherlands was, during many years, nearly or entirely prohibited for various reasons. The export was therefore pretty well restricted to Belgium and through Belgium to France. The export to Germany was mainly transit. The conditions were the same in regard to the export of pigs and sheep.

The export of these animals is shown in the statement on page 13.

The prohibition of the import of cattle and pigs from The Netherlands into England and Germany promoted the slaughter for export in this country; and resulted in a considerable export of meat to those countries. About 18,293 tons of fresh beef and veal were exported in 1913, of which 9,922 tons went to Germany and 7,528 to Great Britain. The export of pork amounted to 35,885 tons, including 25,229 tons to Great Britain and 10,313 tons to Germany. The export of mutton amounted to 6,840 tons, that went mainly to Great Britain.

B. TRADE IN NETHERLANDS MANUFACTURES.

Owing to the scarcity of coal and the absence of minerals like iron, &c., The Netherlands are restricted to manufactures, the raw materials for which are either produced by the country or easily and cheaply imported by water. Further, other industries have sprung up in consequence of local circumstances, some of which have come to a high technical development, like those connected with shipbuilding, dredg-



The "Grängesberg" docking at Rotterdam.

ing material, &c. We can here only mention the production for trade of the most important manufactures. The statistical review gives the export trade of the different productions.

POTATO FLOUR.

The potato flour industry originated from an abundant production of potatoes. Potatoes are extensively grown by the factories in places where the grounds cleared of the surface peat are given up to agriculture, i. e. the so-called *veenkoloniën* (fen colonies), situated principally in the South-east of the province of Groningen, in Drente and Overijssel.

The first potato-flour factory was established in 1842 at Fokshol near Hoogezand, in the province of Groningen and was followed by a second in 1858. An extension of the number of potato-flour factories took place in 1860 and especially in the nineties. Besides the joint stock factories, there are also some run by farmers associated on a co-operative basis.

In 1913 there were at work in The Netherlands 15 co-operative and 21 joint stock potato-flour factories, or in all 36, including 26 in Groningen, 6 in Drente, 2 in Friesland and 1 in Overijssel. These factories consumed in 1913 altogether 720,842 tons of potatoes.

The potato flour is chiefly exported to Great Britain, Belgium, Italy, Spain, Denmark, Norway, &c. The export to Germany appearing in the statistic returns, was entirely or almost entirely imported from another part of Germany.

DEXTRINE FACTORIES.

The potatoes also yield the raw material for dextrine, which is prepared in 7 factories and of which 6,070 million kilograms are yearly exported, mainly to Great Britain, Belgium, Canada, Spain, &c.

BEETROOT SUGAR INDUSTRY.

The Netherlands sugar industry thrives on the beetroots that are so largely cultivated here. It originated in 1858 and there are today 31 beet-sugar factories at work, 4 of which are co-operative, and which conjointly consumed in 1913 1,547,562 tons of beetroot, producing 242,149 tons of sugar.

Statement of trade in Netherlands manufactures.

MANUFACTURES.	Import. Tons.	Export. Tons.	Excess Export. Tons.	Principal countries of destination
Potato flour	26,680	105,822	79,133	Germany 31,473 Belgium 18,964 Spain 8,456 Gr. Britain 20,315 Italy 13,736
Crockery and China (in millions of guilders)	3	7,4	4,4	Belgium 4,5
Beer (in millions of litres) ..	5	9	4	Neth. E. Indies 3 Belgium 1 Gr. Britain 2
Cocoabutter	441	7,164	6,723	U S America 1,535 Belgium 1,302 Germany 1,265 Gr. Britain 9,265
Cocoapowder	110	17,732	17,622	Germany 1,818 U S America 779 W Coast of Africa 22 Belgium 105 Gr. Britain 6,078
Spirits (in millions of litres) ..	13	45	32	Belgium 4
Yeast	1,391	6,198	4,808	Gr. Britain 12 Neth. E. Indies 1
Glassware and bottles (in mil- lions of guilders)	3,2	21	16,8	Neth. E. Indies 0,2 Germany 53,969 Belgium 35,810 Neth. E. Indies 2750 Gr. Britain 763 Belgium 1,257 Turkey 463 Germany 2,294
Gold and silver (wrought) (in millions of guilders)	0,2	0,4	0,2	Gr. Britain 37,446 Portugal 16,763 Belgium 970 Germany 772 Rio de la Plata 646 U S America 1,637
Rice	408,208	225,369	- 182,839	
Tobacco	30,005	6,139	- 23,866	
Candles	228	3,629	3,401	
Kapok	6,949	4,663	- 2,286	

Stearine	3,666	9,284	5,618	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696
Sugar	59,599	198,999	132,400	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696
Salt	126,519	8,902	—	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696
Cigars	21	2,137	2,116	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696
Fishing implements	766	683	— 83	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696
Moss litter	15,015	177,782	162,767	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696
Cinchona	9,050	6,159	— 2,891	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696
Manure (all sorts)	1,394,309	860,148	— 534,161	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696
Factory, agricultural and steam machinery (in millions of guilders)	50	22	— 28	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696
Peanut oil	2,964	9,714	6,750	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696
Linseed oil	551	25,448	24,897	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696
Cotton fabrics (in millions of guilders)	27	38	11	Belgium 4,089 Columbia, Equador and Venezuela 1,246 Belgium 2,010 Gr. Britain 167,631 Ireland 19,362 Morocco 7,390 Germany 2,219 Gr. Britain 1,578 Belgium 2,021 Neth. E. Indies 817 Belgium 272 Germany 436 Gr. Britain 154 Gr. Britain 79,335 Belgium 61,537 Germany 21,242 U. S. of Am. 7,746 Germany 3,338 U. S. of Am. 1,268 Gr. Britain 1,057 Germany 452,722 U. S. of Am. 77,466 Belgium 57,914 Gr. Britain 42,696

1) The import of potato flour comes principally from Germany, especially from Stettin by sea to Rotterdam, and goes back to Germany by the Rhine. The above mentioned export to Germany includes the greater part of the stated import. According to the fiscal returns, very little potato flour made here is exported to Germany.



The "Rotterdam" of the Holland-America Line.

Of these factories 18 are situated in the province of North Brabant, where the most extensive sugar-beet growing is carried on, 4 in South Holland, 2 in Groningen, 2 in Gelderland, 2 in Zeeland and 1 each in Overijssel, Utrecht and North Holland. They chiefly supply trade with raw sugar, of which a quantity of 40,535 tons was nearly all exported to Great Britain. The bulk, however, is delivered to the Netherlands sugar refineries. Though the refineries also treat some cane sugar, the raw beetroot sugar is their chief material.

SUGAR REFINERIES.

Sugar refining has long been an important industry in The Netherlands. Until the seventies of last century, we received the raw sugar mainly from Java, but since that time the import has diminished and has been replaced by the product of the beetsugar factories.

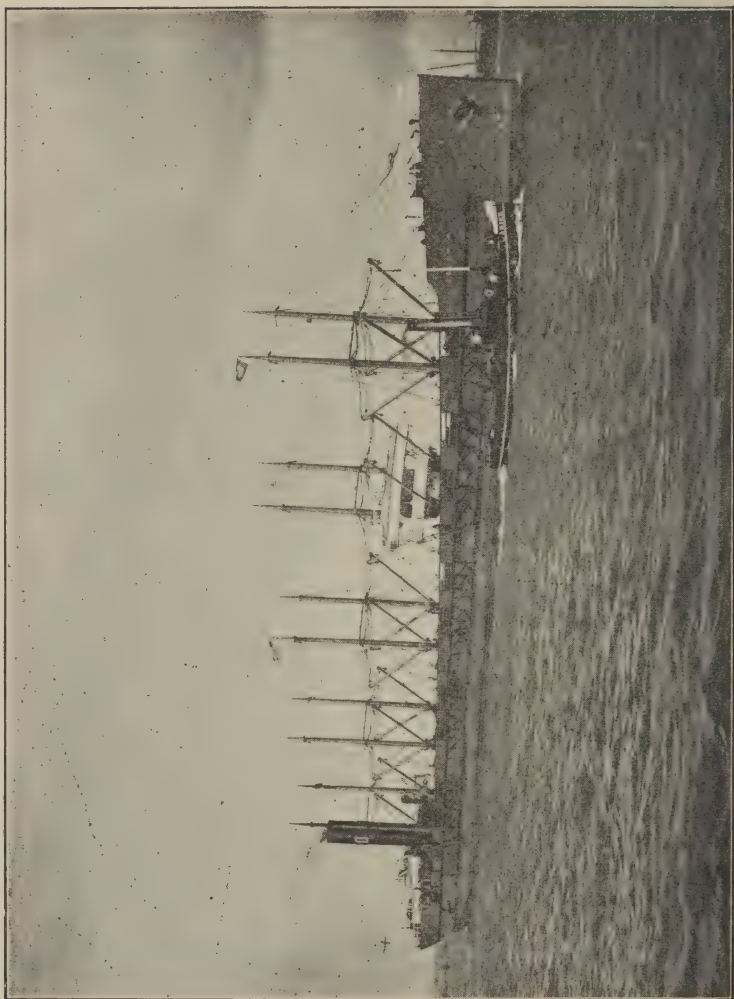
The largest sugar refineries are found at Amsterdam and further at Rotterdam, Vlaardingen, Groningen and Rozendaal. The export of refined sugar amounted in 1913 in all to 157,182 tons. The greatest quantity is exported to Great Britain and Ireland, and further to Morocco, Norway and Belgium.

THE PAPER INDUSTRY.

Ever since the latter part of the 16th century paper-making has been an important industry in The Netherlands working for export. At the present time there are in this country 34 paper factories of various capacity, producing different sorts of paper. The materials used for this manufacture are: rags, cellulose of coniferous wood, straw and pulverised wood, and old paper. Most of the materials come from abroad. Rags and straw are home products. The import of these materials is very important. In 1913 it amounted to 783,000 tons.

The principal sorts of paper made here are: writing paper, printing paper, packing paper, pasteboard and straw-paper. The old Holland writing paper is well known and bears a good name.

In 1913 The Netherlands exported nearly 18,873 tons



The „Skandia“ at Rotterdam.

of writing and printing paper to Great Britain, Belgium, the Netherlands Indies and other countries. Of packing paper 8,417 tons was exported, chiefly to Great Britain.

The straw cardboard industry occupies an important place in this country. It originated in 1869 in Groningen, and has its particular home there in the fen or peat colonies, by the side of the potato-flour industry. The raw material is straw, chiefly supplied by this province itself, where much grain is grown. There are now at work in this country 21 strawcardboard factories, of which 20 are in the province of Groningen and 1 in Drente, and which together consume about 285,000 tons of straw. The total production of cardboard amounts to about 210,000 tons, of which some 90 per cent is shipped to Great Britain, whence it is distributed over the British colonies. In 1913 the export of straw and other pasteboard amounted to 172,807 tons, of which 151,580 tons went to Great Britain and Ireland, and further 6,460 tons to Belgium, 4,393 tons to Turkey, 1,102 tons to Egypt, 1,011 tons to the Netherlands Indies, &c.

SPIRITS AND YEAST.

Spirits are the more or less pure alcohol obtained by fermenting or distilling of sugar containing liquids. Generally, they are derived from rye, barley and maize as a raw material and also from molasses, the syrup from the sugar factories. In Germany potatoes are used as material for winning alcohol and were formerly also used in this country, but this has long since been discarded.

Spirits are produced here :

- 1) in the form of malt spirits, mainly in the grain breweries and at Schiedam ;
- 2) as purified spirits, from grain and molasses, chiefly at Delft, Bergen-op-Zoom, Sappemeer and Zevenbergen ;
- 3) by a further treatment of malt spirits alone or of malt spirits and pure alcohol in the distilleries; and
- 4) by conversion into liquors.

The preparation of malt spirits and alcohol produces yeast as a by-product.



The "Rijnhaven," Rotterdam.

The production of spirits requires quantities of grain and is consequently of great influence on the grain trade. The export of spirits is very important; in 1913 it amounted to 11,645,538 gallons, the half of which went to the West-coast of Africa; further exports went to Belgium.

The yeast is partly used at home, and nearly all the remainder goes to Great Britain.

CANDLES.

The manufacture of candles, formerly an insignificant village industry, with tallow and wax as principal materials, has become quite a different trade since the middle of the 19th century owing to the introduction of the stearine candles. These are made from the firm acids of tallow, sheep's fat, palm oil and other fats. The candles consist almost entirely of stearic and palmitic acid, a mixture that bears the name of stearine.

The first stearine candle factories in this country arose in the middle of the 19th century. At first there were a number, but gradually they concentrated in two large factories, one at Gouda and one at Schiedam. These both produce stearine as a raw material and candles.

Besides fats, palm oil forms an important material in this industry. The import of palm-nut kernels in 1913 amounted to 63,711 tons and that of palm oil to 23,915 tons.

The export articles of this industry are in the first place candles, and further stearine for candle manufacture elsewhere. In 1913 3,629 tons of candles were exported, principally to Belgium, the countries on the Rio de la Plata, Turkey and many other lands. The large scale export of stearine candles originated in The Netherlands, but competition afterwards asserted itself in many other countries. Of stearine or compressed fat 3,666 tons were imported in The Netherlands and 9,284 tons exported thence. The export was directed principally to Belgium, Germany and South America.

A by-product of the stearine industry is elaine, of which there was exported in 1913 nearly 2,831 tons, distributed over several countries.

Another by-product, which is also obtained by the



View on the Y near the "Handelskade" at Amsterdam.

manufacture of soap, is glycerine, of which 9,098 tons were exported in 1913, mainly to Belgium, and also to Great Britain, Germany and other countries.

EARTHENWARE.

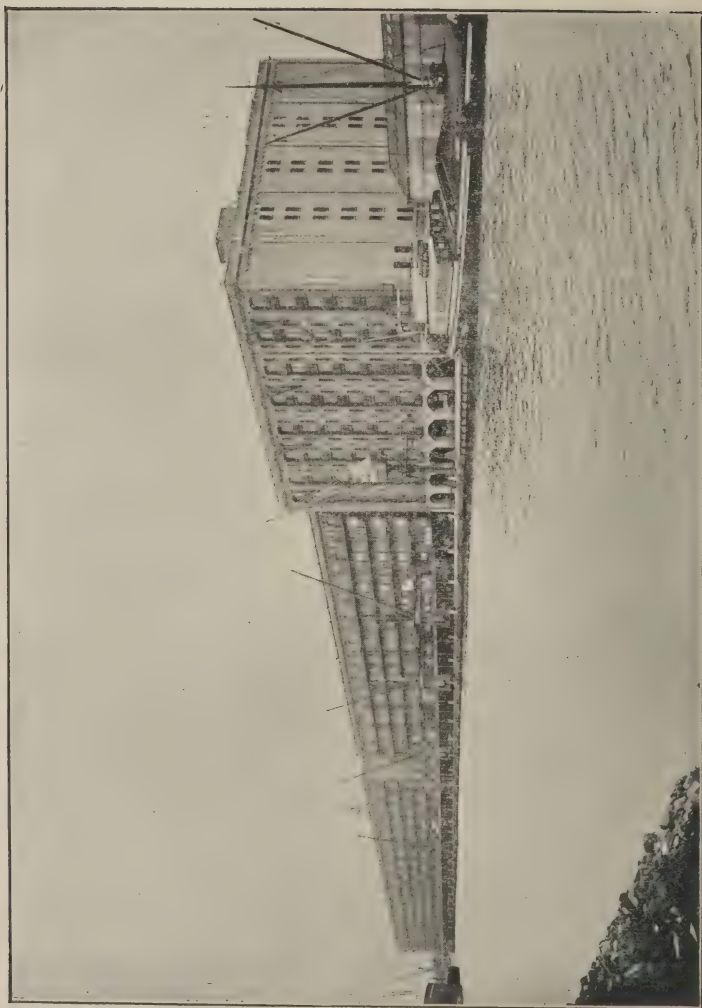
The manufacture of earthenware, faïence or delft-ware was an important industry in this country as long ago as the 17th century. The delft-ware pottery especially took a high flight in the latter half of that century, but almost dwindled away towards the end of the 18th century. The remnants of the products of the old industry are still of great value.

The manufacture of earthenware revived at Maastricht in the 19th century. After the separation of Belgium from The Netherlands, Mr. PIERRE REGOUT, then one of the foremost importers of Belgian glass and earthenware, established in that town a manufactory of domestic implements, later, in 1834, a crystal and glass factory and in 1836 a crockery factory. A wide export secured the Maastricht crockery universal renown, and in 1858 a second earthenware factory was established there. Finally Mr. Joost THOOF began in 1876 to re-animate at Delft the old and nearly vanished industry and very soon the Delft product obtained a fresh renown. The delft-ware bakeries also sprang up elsewhere, as at The Hague, Amsterdam, Utrecht, Gouda, Purmerend, Bergen-op-Zoom, Zoeterwoude, Leyden, &c.

Earthenware may be divided into the fine sorts, faïence and porcelain, and the coarser sort: crockery. The finer sorts have the most value for export. Today there are 27 factories in this country, of various capacity, producing fine earthenware. The principal export goes to Belgium, and further to the Netherlands Indies, Germany and South America.

The coarser sort of earthenware, like: pots, pans, jugs, flower pots, is made at Gouda, and also in Friesland, Limburg and most of the other provinces. In 1913 about 12,339 tons were exported, mainly to the Netherlands East Indies, Belgium and Germany.

Clay tobacco-pipes are still, as for ages past, made at Gouda, but no longer in any great quantity. In 1913 188 tons were exported to Belgium, Great Britain, the United States, the Netherlands East and West Indies, &c.



View upon the Amsterdam tea warehouses (bonded stores).

GLASS.

The Netherlands glass industry consists in the first place in the manufacture of bottles. Fifteen glasshouses work in this line, namely : at Delft, Leerdam, Nieuw Buynen, Nieuwerkerk-on-the-Yssel, Rotterdam, Schiedam, Vlaardingen, Zwyndrecht and Culemborg. The export of bottles amounted in 1913 to 13,026 tons, mainly exported to Great Britain, Belgium and also to the United States.

An important branch of this industry is the production of different sorts of glassware, from fine crystallglass to simple wares, chiefly manufactured at Maastricht, Meerssen, Leerdam and Nieuw Buynen. The export amounted in 1913 to 12,866 tons, sent principally to Great Britain, Belgium, the United States, Germany and several other countries.

At Sas van Gent there is a manufactory of plate-glass, and a new factory for window-glass has been opened at Maassluis. The production for export is as yet unimportant.

TEXTILE INDUSTRY.

COTTON FABRICS.

The textile industry is one of the oldest and most extensive employments in The Netherlands. About $25\frac{1}{2}$ per cent of the hands occupied in the trades (viz. : 57,600 persons) are engaged in it.

The main part, $18\frac{6}{10}$ per cent works in the spinning and weaving branch, and $18\frac{8}{10}$ per cent are employed in the seasoning and printing department.

According to the consumption of material, the chief branches of the textile industry are those of cotton and wool; and further there are those of linen, jute, ramie, kapok and silk. According to the products, there are : cotton-spinning and weaving, spinning of woollen yarns, worsted, etc., weaving of woollen fabrics, like flannel, buckskins, etc., weaving of linen, damask, etc., weaving of gunny bags, and knitted work. The cotton-industry has widely extended since 1830, owing to the demand for cotton fabrics for the Netherlands Indies. Aided at first by tariff in India, the cotton industry

very soon became so strong that the abrogation of this protection in 1874 not only failed to injure it, but caused it to extend and gain in strength by free competition. It is principally carried on in this country in the eastern part of the provinces of Overijssel and Gelderland, where spinning, weaving, dyeing and bleaching works are to be found. Further, a cotton weaving region is found in North Brabant, around Helmond, Gemert and Eyndhoven, while isolated factories work at Deventer, Leyden and Veenendaal.

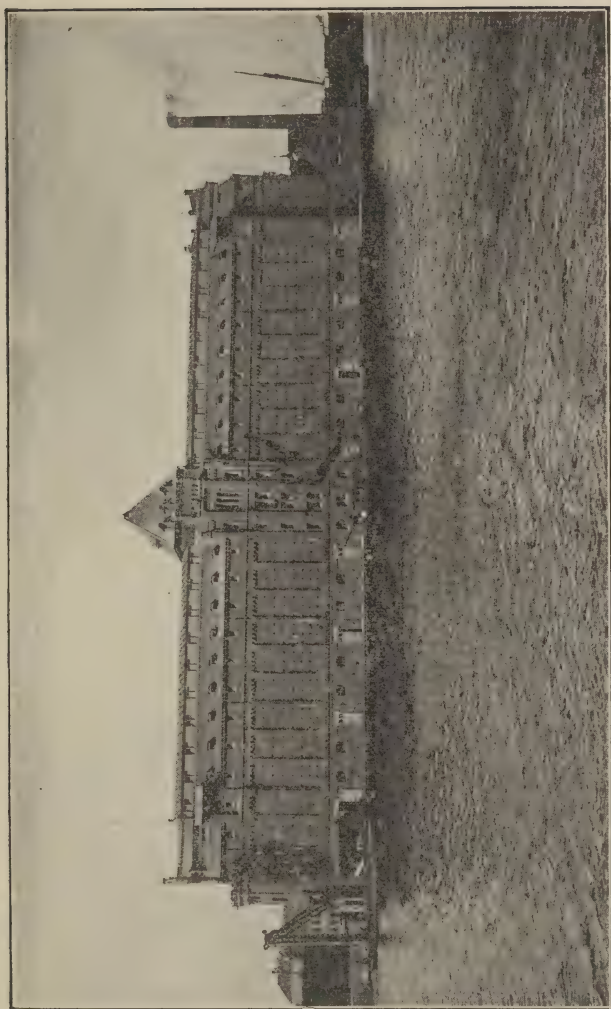
The chief products of cotton weaving are: (a) the smooth fabrics or prints, comprising the calicos, madapolams, shirtings, cambrics, jaconets, nankeens and the like; (b) the twilled fabrics, like drilling, corduory and swanskin; and (c) jacquard fabrics like cotton damask, "piqué" (quilting) and velveteens. Next to the weaving works, either joined to them or separate, are found finishing shops, like printing, dyeing and bleaching works.

The export of cotton fabrics has increased enormously in the last half century. A great part goes to the Netherlands East Indies, but the article is also imported in other countries.

The following statement shows the development of the export of cotton fabrics:

Export of cotton fabrics.

YEAR.	Total export	Export to the Neth. East Indies	Export to other countries.
	Value in thousands of Dollars.		
1844	2,175	2,056	119
1850	1,777	1,697	80
1860	5,291	5,133	158
1870	7,013	4,534	2,479
1880	8,497	6,794	976
1890	11,756	9,256	2,500
1900	13,712	6,773	6,939
1913	30,692	13,865	16,827



Grain-elevator at Amsterdam.

The Netherlands East Indies have always been a prominent consumer of our cotton fabrics, but the demand of foreign countries has also gradually increased. The foreign export goes to British India, Turkey, Belgium, Great Britain and other countries.

The materials used in the cotton industry are unspun cotton for the spinning mills and cotton thread. In 1913 68,734 tons of unspun cotton were imported in this country coming from Germany, where Bremen is the principal cotton market, the United States, Great Britain, Egypt, Belgium &c. Of cotton yarns untwined and undyed, 38,031 tons were imported from Great Britain, Germany and Belgium.

WOOLLEN FABRICS.

As early as the middle ages The Netherlands already had important wool-weaving works, for which the material was imported from England. In the 17th and 18th centuries England herself entered into competition, and though the industry continued in the Netherlands villages, it had mostly disappeared in the towns by the end of the 18th century, to be revived again in the 19th century. The wool is here converted into yarns and worsted into flanel, buckskin, blankets, knitted ware, carpets, "velours d' Utrecht", mock velvet, &c. The spinning of wool is practiced at Bolsward, Tilburg, Veenendaal and Leyden. The manufacture of woollen fabrics is mainly carried on at Tilburg and also at Leyden, Geldrop, Eyndhoven and Almelo.

There are ten woollen blanket factories in this country, mostly at Leyden, and further at Helmond, Tilburg and Maastricht. Of carpet manufactories there are 35. The principal one is at Deventer, whilst there is 1 at Rotterdam, 1 at Dinxperloo and several small ones at Hilversum and Laren in the Gooyland (North Holland) and at Amsterdam.

The raw material for the wool industry is chiefly imported. In 1913 the import amounted to 18,169 tons. The greater part came from London, the staple wool market, and smaller quantities straight from Argentina, Russia and Belgium.

Of woollen fabrics, cloths, buckskins, &c., The Nether-

lands exported in 1913 2,693 tons, the largest quantities to Belgium, Great Britain and the Netherlands East Indies.

The production of blankets serves mainly for home consumption; 673 tons were exported, mostly to the Netherlands East Indies.

Of carpets The Netherlands exported about 1,125 tons, value 1,311,980 Dollars. The greater part went to the United States, to Great Britain, Turkey and other countries.

LINEN FABRICS.

Though flax is grown and exported from here, there are no flax-spinning works in this country. But linen-weaving is still carried on here, though not to any great extent. It is principally to be found in North Brabant, while in several manufactories it is practiced in combination with the weaving of cotton. The linen industry produces damask and diaper table-linen, bed sheets, towels, bath-towels, fabrics for female clothing, half linens, &c. The export figures of these products cannot be given, as they do not appear separately in the statistical returns.

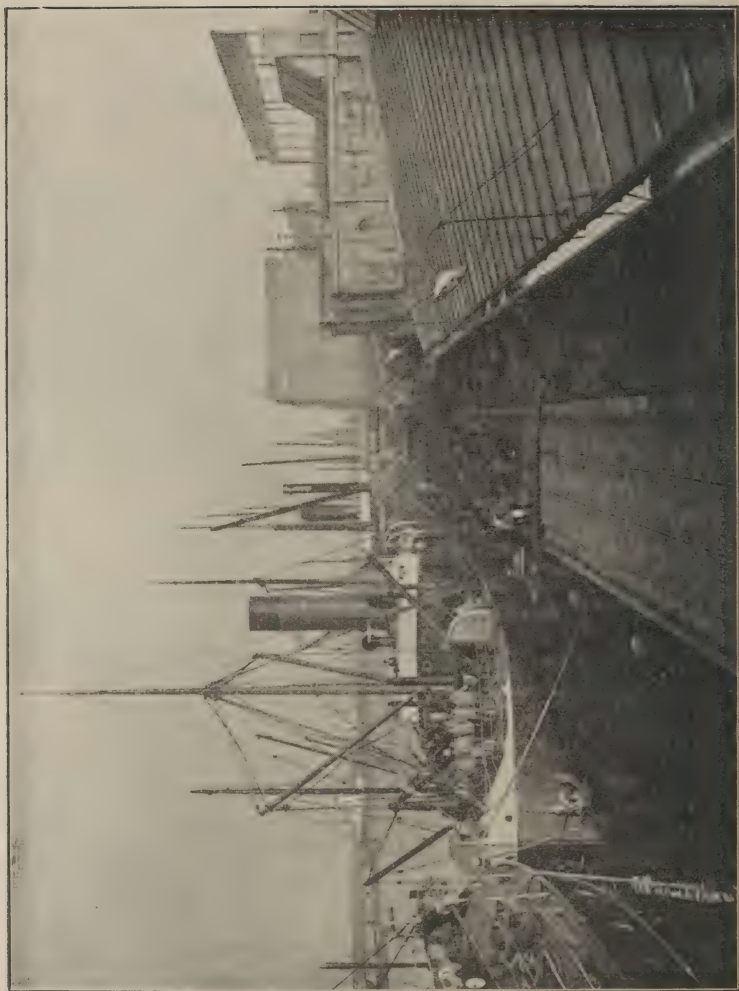
JUTE WEAVING.

The jute, which comes from British India in the shape of working material, is largely spun and woven in this country at Ryssen and converted into bags for packing. This industry works for home use and for export.

OIL INDUSTRY.

This is a very old trade in The Netherlands. It was formerly carried on by windmills, that pressed the oil out of the seeds. In the middle of the 19th century oil mills were still extant in all parts of the country, but mainly around the river Zaan, the special mill region. The materials employed were: linseed, colza and rapeseed, which seeds were partly grown at home and partly imported. Colza and rapeseed were much cultivated formerly, and many farmers took their seed to the mill, to receive it back in the form of oil and oilcakes.

The cultivation of oil seeds in this country has greatly



Buildings and steamers of the Holland Steamboat Cy at Amsterdam.

diminished during the last half century, the use of oil at the same time largely increasing. Meanwhile, the oil trade has become world-wide, and thus the demand for raw material is enlarged. The import of oil-bearing products has become very important. An extension of trade connections with far-away countries has largely increased the number of products from which oil is obtained. The principal seeds, kernels and fruits used for the purpose are : linseed, hempseed, colza and rapeseed, mustard seed, groundnuts, sesame seed, soya beans, coprah, cotton seed, kapok seed, palm-nut kernels, castor seeds, cacao kernels and almonds. In all there are in this country about 175 oil mills, the greater part in North and South Holland. Of these, 28 are large modern factories.

Of the oil seeds linseed is the most consumed. In 1913 import amounted to 286,035 tons, mainly from the countries on the Rio de la Plata, viz : 162,313 tons ; further, Russia sent us 29,348 tons, the United States 25,622 tons, Belgium 30,849 tons and British America 21,585 tons. The export amounted to 86,359 tons, mostly to Germany, leaving a balance of 199,576 tons for home consumption, principally converted into linseed oil and oilcakes.

Of colza and rapeseed there were imported 47,909 tons, chiefly from Belgium, Roumania and Russia. The export amounted to 19,242 tons, leaving 28,667 tons for home use.

Of other oil seeds, not separately returned, there were imported 89,622 tons, viz. : from China 45,879 tons, from Egypt 26,888 tons, and from the Netherlands East Indies 5,273 tons, while the export amounted to 40,612 tons, nearly all to Germany.

A small quantity of the oil seeds required for the oil industry is grown at home, but less than formerly. In 1913 the crop of colza in this country amounted to 2,084 tons, of linseed to 8,139 tons and of canary seed to 3,560 tons.

Besides seeds, other materials have been introduced in this industry. One of them is coprah, which has become an important commodity, but will be treated with the colonial products.

Palm-nut kernels were imported in 1913 to the amount of 63,711 tons, coming mainly via Hamburg, while 57,563 tons were exported to Germany.

Several sorts of beans are grown by the natives of Java under the name of "Katjang", among them the "Katjang Tjina" (*Arathis Lypogea* Lx) or groundnut, used in Java for making oil for domestic purposes, but now exported in immense quantities under the name of *Arachides*. The chief importers of these nuts from Java are Singapore, France and Germany, and only a small part comes to this country. Nevertheless, great quantities of this article are imported here, in 1913 67,428 tons. These came mainly from the West-coast of Africa, viz 38,582 tons, and from China 6,556 tons; further by secondhand trade from Belgium, Great Britain and Hamburg, each about 6,300 tons. Only 1,194 tons came from the Netherlands East Indies. We exported 19,163 tons, chiefly to Germany. leaving a balance of 48,265 tons. The groundnuts are employed to make oil. They produce an oil that does not dry, the finest sorts being used for cooking and at table. The Delft salad-oil, the product of one of the greatest oil factories in The Netherlands, is made of groundnuts and serves for culinary purposes, while it is largely used in making margarine, for preserving sardines, &c. The dry remnants of the nuts are, after being thoroughly squeezed, make into oil-cakes and form an excellent fodder for cattle. In 1913 The Netherlands exported 9,417 tons of groundnut oil, mainly to Great Britain, and further to the United States and Belgium, and 11,330 tons of groundnut meal and cakes to Great Britain, Hamburg and Belgium.

The oil industry in this country does not fully supply the consumption of edible oils. Some 33,393 tons of edible oils were imported here in 1913 and 10,898 tons exported. The principal import consisted of cottonseed oil, viz : 23,391 tons from the United States and 2,243 tons from Great Britain, and 1,195 tons of groundnut oil from France, 1,781 tons of rapeseed oil from Germany and 1,082 tons of sesame oil from Germany. Groundnut oil was principally exported to Great Britain, viz : 5,733 tons. Of linseed oil and allied oil 5,689 tons were imported and 27,473 tons exported, so that this is a rather important article of export. Linseed oil is exported chiefly to Germany, 10,526 tons; to Belgium 4,755 tons; to the Netherlands East Indies, 2,155 tons; and to Great Britain 3,809 tons.

MANURES.

Agriculture and horticulture being very intensive in this country, the supply of manures is an important branch of trade and manufacture. The subjoined statement presents a view of the whole trade.

Import in 1913.		Export in 1913.	
Tons.		Tons	
Stable manure.	{ Germany .. 13,498	Total 10,574	Belgium 9,827
Total 23,982	{ Belgium.... 10,376		
	{ United St. of		
	{ N. A..... 5,400		
Guano.	{ Pacific Ocean 4,900	Total 10,968	{ Germany.... 7,578
Total 22,313	{ Belgium 4,693		{ U. S. A. 1,302
	{ Chili 2,350		
	{ Norway 1,131		
	{ Rio de la Plata 1,954		
Bone dust.	{ Germany.... 6,052	Total 12,033	{ Gr. Britain.. 5,178
Total 7,046			{ U. S. A. 4,760
Chili Saltpeter.	{ Chili 168,405	Total 121,095	{ Germany.. 118,469
Total 203,585	{ Belgium .. 31,344		{ Russia 1,258
	{ Germany.. 3,719		{ Belgium .. 1,170
			{ Germany.. 160,642
			{ Spain 29,535
			{ Gr. Britain 19,764
			{ Denmark.. 13,430
Superphosphate.	{ Un. St. of	Total 352,849	{ S. Africa.. 8,322
Total 270,378	{ America 102,308		{ Australia.. 7,179
	{ Belgium .. 94,807		{ Algeria .. 7,363
	{ Algeria.... 38,970		{ Netherlands
	{ Morocco .. 22,848		{ East Indies 3,126
	{ Pacific Ocean 6,800		{ W. Africa.. 3,244
			{ Italy 15,678
Thomas	{ Germany.. 362,216	Total 197,854	{ Norway 6,009
Phosphate.	{ Belgium .. 60,442		{ Ireland 1,570
Total 438,113	{ U. S. A. .. 45,844		{ Germany .. 144,085
			{ Russia 27,033

Ammonium Sulphate.	{	Germany .. 27,752	Total 18,702	{	Netherl. East Indies 11,693
Total 31,177		Gr. Britain . 2,991			Gr. Britain . 5,242
					Belgium 1,283
Potassium Sulphate.	{	Germany .. 105,182	Total 7,069	{	Gr. Britain .. 3,570
Total 105,193					U. S. A. 1,970
					Nethl E Indies 1,288

The trade in chemical manures and their raw materials has become very extensive. They are not merely traded in but are also manufactured on a large scale in this country. Superphosphate works are found at Amsterdam, Zwyn-drecht, Capelle o/Y, Rozenburg, Hoogkerk (Groningen) and Uden (N. Brabant), and further there are several works that make other sorts of manure. These factories work for home consumption and for export. A great part of the imported manures is also treated by them and converted into more adequate products.

THE METAL INDUSTRY.

This industry has been largely extended in this country since 1870, when the new waterways from Rotterdam and Amsterdam to the sea were completed and shipping and trade were revitalised. The Netherlands do not possess any materials for this industry, neither metallic ores nor sufficient coal. The extension of the iron industry is owing to its relation with other branches of occupation, viz.: shipping, textile manufacture, &c., the primary stimulant being need of machinery for the rising trades. But this auxiliary industry expanded freely and built works for making machinery, iron constructions, ships, rolling stock for railways and tramways, electrotechnical implements and objects of divers metals.

In all there are in this country 180 machinery works, large and small, mainly in South Holland, on the Noord and Nieuwe Maas rivers, where they are combined with ship-building yards. In North Holland Amsterdam is the centre of the machinery industry, to which may be added that of Haarlem and on the river Zaan. Further, there are some



A dredging machine.

works in Twente, especially at Hengelo and Enschede, in Groningen, in North Brabant and some small ones elsewhere.

Most of the machinery works produce power machines and labour implements, besides apparatuses for a chemical treatment of materials, like boilers and brewing plant. Several iron works are specially employed in constructing steamship machinery, or complete apparatuses for sugar mills, lifting implements, machinery for moving bridges and locks, &c. A special and well-known product are the dredgers and excavators, pumping engines, dairy apparatus, &c. The building of different motors is also very important.

Some six factories in this country are engaged in making electric lamps, with metal or carbon filament, a large one at Eindhoven working for export on a large scale.

The above-named branches of industry involve a brisk trade, first by the import of all sorts of materials from abroad and then by the export of many manufactures. The greatest compass is taken up by shipbuilding, which is nearly all iron construction since steam navigation has preponderated and so has become the principal branch of the iron industry. About 212 shipbuilding yards without engineworks, employing 9,800 hands, and 24 with engineworks, employing 11,600 hands, are at work in this country, mainly in the provinces of South Holland and Zeeland (Flushing). The three principal yards are found in Amsterdam, Rotterdam and Flushing. Vessels for inland navigation and for abroad are built here for different countries.

ARTICLES OF COLONIAL MANUFACTURE AND TRADE.

The Netherlands colonies, especially the East Indian, supply the mother country with an important quantity of articles, which are partially wrought here before being sold, partially only assorted and classified for the world's trade. Before 1860, when many Government cultures still existed in the Indies and the products of these establishments were nearly all sent home, the Netherlands market was the special medium for introducing the Indian products into the world's trade. Since 1870 a market has been opened in India too, and several products are sold direct from there. The principal



The cargo steamer "Willem II" of the Steam Navigation Company "Nederland."

product of India is cane sugar, which formerly governed the sugar trade in The Netherlands; at present only a little cane sugar is sent home.

Yet the import from the Netherlands East Indies still forms a considerable part of the total import in The Netherlands. In 1913 it amounted to nearly 211 million Dollars in value or 13.5 per cent of the total value imported. The value of the export from here to the Netherlands East Indies amounted in 1913 to 65,2 million Dollars, or 5,3 per cent of the total export.

The principal products from the Colonies that are in either manufactured or unmanufactured form turned into the world's trade by The Netherlands are: cocoa beans, coprah, rubber, gutta percha, cinchonabark, cocoanut oil, sago, tapioca, gold, groundnuts, tropical wood, hides, kapok, coffee, rice, rattans, spices, sugar, tobacco, tea. Several of these articles are partly, some even mainly, imported here from other countries. Some are wrought here.

Appendix II presents a review of the principal products of the Netherlands Indian colonies appearing in the market here and exported thence, as shown by the Netherlands statistics.

COCOA AND CHOCOLATE.

The cocoabeans were brought from Mexico to Europe by the Spaniards in 1520, when the first chocolate manufactories were established in Spain. In The Netherlands the manufacture of chocolate was carried on in a primitive manner as early as the 17th century. It consisted in grinding the roasted beans and converting the fine powder into tablets. But the industry continued to flag until in 1828 a Netherlander, Mr. C. J. VAN HOUTEN, succeeded not only in extracting the superfluous fat from the beans but also in bringing the remaining mass into a form such as to allow the cocoa to fully retain its nutritive properties and be easily made into a tasteful beverage. This discovery was the impetus for the development of the chocolate and cocoa industry, i. e. the manufacture of a pure powder, without the addition of any foreign substance, that could be dissolved in boiling water

or milk, whilst at the same time diffusing an agreeable aroma. These nutritious and tasteful products met with general approval and created in this country a very important industry, at present exercised in 44 cocoa and chocolate works, large and small, either separate or conjointly, 25 of which are found in the province of North Holland, mainly in Zaanland, in and near Amsterdam, at Weesp, Bussum and Haarlem, Rotterdam, The Hague, Breda and Helmond.

The factories of this country consume about one-eighth of the world's production of cocoa. The cocoa beans, the chief material, are an article of import. In 1913 the import amounted to 43,191 tons, imported here from Hamburg, Great Britain, France, Portugal, the Netherlands Indies, South America, the Antilles and other countries.

The products of this industry are: cocoa powder, chocolate, and cocoabutter, i. e. the fat from the beans. The export of cocoapowder, prepared with or without sugar, is very important. It amounted in 1913 to 17,732 tons. That of chocolate was 1,215 tons. The powder is mainly exported to Great Britain, Belgium, Germany and the United States. The chocolate went chiefly to Belgium and Great Britain.

The cocoabutter, a by-product derived from the fat pressed out of the beans in making cocoapowder, proved to be an important commodity, it being useful for the preparation of chocolate, perfumes, soap, &c. Monthly auctions of cocoabutter are held in Amsterdam. The export of this article amounted in 1913 to 7,164 tons and went to the United States, Germany, Belgium and Great Britain.

COPRAH.

The dried and broken-up kernel of the fruit of the coconutpalm, the so-called coprah, has become a very important commodity in the last twenty years owing to the increasing demand for fats. As early as 1875 this article began to appear in the market at Amsterdam, but especially after 1904 a big extension of the coprah trade set in.

It is mainly imported from the Netherlands East Indies. Of the total import of 100,635 tons 89,609 came from there. Coprah is chiefly imported at Amsterdam.



Installation for unloading coal at Amsterdam.

A part of the imported coprah is consumed by the oil mills in this country, but fully 82,356 tons was re-exported in 1913, mainly to Germany, which country took 72,370 tons; further, 5,430 tons to Belgium and 3,299 tons to Russia.

Of cocoanut oil 5,376 tons were exported, chiefly to Germany.

CAOUTCHOUC OR RUBBER.

The rubber industry has very much expanded during the last 20 years, so that the trade in the raw material has also become very extensive. The Netherlands East Indies supply this country with the half of the required rubber. Against an import of 8,039 tons stands an export of 5,610 tons, mainly to Germany and Great Britain.

CINCHONA BARK.

Owing to the cinchona production of the Netherlands East Indies, still partly grown by the Government, but at present mainly produced on private plantations, a considerable market of bark flourishes here. The cultivation is established in Java, and the export is principally directed to this country. The private establishments of Java exported 8,055 tons of bark in 1913, of which 7,708 tons came here; and the Government sent home 884 tons.

The Netherlands statistics record an import of 9,050 tons of bark, all from the Netherlands East Indies, and an export of 6,159 tons. This export went mainly to Germany, the United States and Great Britain.

The cultivation of cinchona has led to the establishment of manufactories of sulphate of quinine. In 1897 one was erected at Bandoeng in Java. There are two in this country and altogether 12 in the whole world. We have no data concerning the export of quinine.

HIDES AND SKINS.

The Netherlands have for ages carried on an important trade in hides, principally located at Amsterdam and at Rotterdam, which trade also necessitated the establishment of

tanneries in this country. The trade has extended pretty regularly of late years.

Special trade in dry hides, in tons.

	Imports.	Exports.	Excess of imports.
1867-76	4,788	4,638	2,150
1877-86	7,798	5,638	2,160
1887-96	9,985	6,634	3,351
1897-1906	12,845	9,480	3,374
1913	18,779	10,959	7,820

Special trade in salted hides, in tons.

	Imports.	Exports.	Excess of exports.
1877-86	4,844	5,971	1,137
1887-96	4,949	6,913	1,964
1897-1906	9,089	13,049	3,960
1913	15,507	19,232	3,775

The trade in dry hides is largely fed by the export of hides from the Netherlands Indies. In 1913 fully 6,153 tons, or nearly a third of the total import, came from there, the remainder being imported from Belgium, Great Britain and Hamburg. The share of the Netherlands Indies in the import of salted hides is but small. These came mainly from Germany, Great Britain and Belgium.

A considerable quantity of dry hides is exported again, principally to Germany (about 7,421 tons) and to the United States (1,053 tons), but a balance of 7,820 tons is left for the use of the home industry.

The salted hides show an excess of export. This went in the first place to Germany, 9,210 tons, further to the United States, 3,822 tons, and to Belgium, 3,287 tons.

The tannery is most developed in North Brabant and occurs further in the provinces of Gelderland and South Holland. The import and export of sole leather are about equal. Other prepared hides and skins were imported to a

value of 5,6 million Dollars, while the export is valued at 9,6 million Dollars. This shows an excess of export, supplied by the Netherlands industry for one half to Germany and further to Great Britain and other countries. Indian buffalo-hides are chiefly used for making driving belts.

KAPOK.

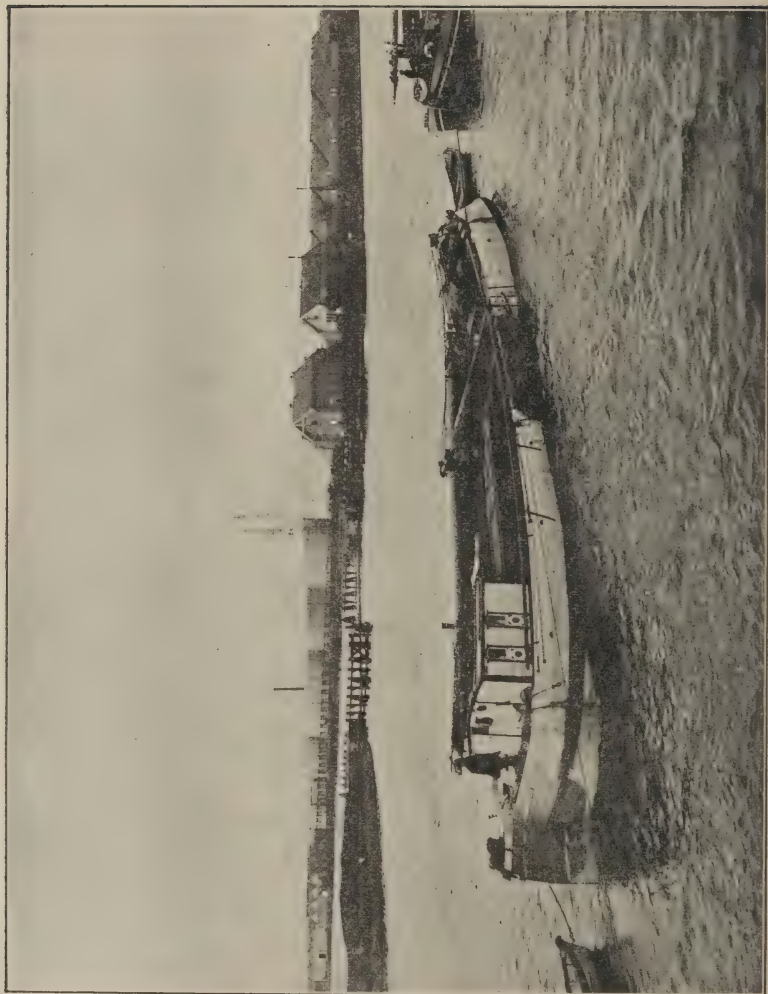
The kapok tree of India produces the kapok, a fibre material of an excellent quality for filling cushions, mattresses, bandages, &c , and one that is much cheaper than horse-hair or wool. It has the advantage of being light, very elastic, of absorbing little water and not being liable to rot. The export of this article from India is of recent date; it only became of importance after 1880. In 1913 the export from the Netherlands East Indies amounted to fully 10,145 tons. Java exports it principally to this country, viz. 3,691 tons, further to Australia, 2,110 tons, and to the United States, 1,377 tons.

In 1913 the import in The Netherlands amounted to nearly 6,949 tons, mainly from the Netherlands East Indies, and the export from here to 4,632 tons, mainly to Germany and the United States. There are 19 kapok works in The Netherlands, where the article is cleaned and mechanically carded and made fit for use.

COFFEE.

Though coffee was known in Europe before it came to this country, The Netherlands have greatly contributed towards its spread as a universal beverage. In 1660 coffee from Mocka was offered for sale in the Amsterdam market, and in 1711 the first coffee grown in Java was shipped home.

Coffee was introduced in the Netherlands East Indies as a compulsory Government cultivation and existed as such until lately. Owing to the Government coffee culture in Java, the home market has for many years been supplied with coffee from the Netherlands East Indies. As the Government culture decreased private cultivation expanded. In the course of past centuries The Netherlands have occupied a prominent place in the world's coffee trade. It gravitated here in the middle of the 19th century.



The "Petroleumhaven" (petroleum harbor) at Amsterdam.

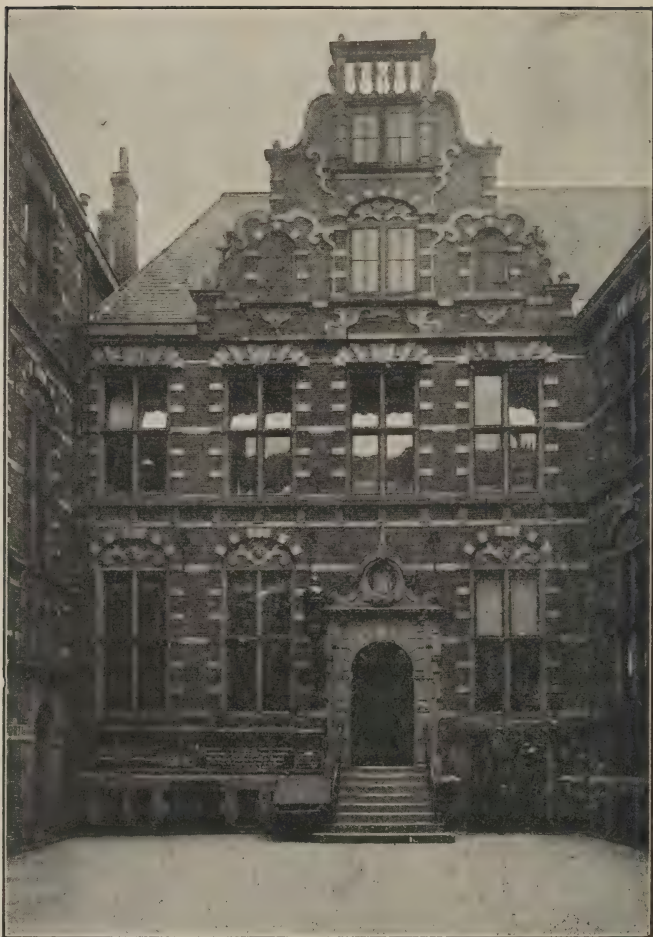
But then there appeared a powerful competitor with the Java coffee, namely, that of Brazil, while the production of the *prima Java* diminished. The import here from Brazil very soon surpassed that from the Netherlands East Indies, so that the Brazilian product is now the principal article in the Netherlands coffee trade.

The import of coffee in this country amounted in 1913 to in all 144,957 tons, of which 91,614 tons came from Brazil, 21,666 tons from the Netherlands East Indies and 11,225 tons from France. The export amounted in 1913 to 92,000 tons, of which 61,264 tons went to Germany, 9,484 tons to Belgium, 3,699 tons to Denmark, 3 370 tons to Norway, etc. An excess of 52,957 tons of import over export points to the large consumption of coffee in this country.

TEA.

This is another cultivated article very much spread through the agency of the Netherlanders. In 1610 some of our countrymen brought the tea obtained from Chinese merchants at Bantam to Europe, and the East Indian Company did its utmost to promote the use of tea here. In the latter part of the 16th century the use of tea was already pretty well known in Western Europe, and it augmented in the 17th and the 18th centuries. The greatest extension followed in the 19th century, and even recently the use of tea has continued to rapidly increase. Great Britain is the leading consumer of tea, with a figure of 2,74 K.G. per head per year; then follows The Netherlands with 0,65 K.G., the United States with 0,55 K.G. and Russia with 0,48 K.G.

Up to the middle of the 19th century the market was supplied with tea almost exclusively by China. But in 1827 the cultivation of tea was introduced also in Bengal, in 1835 in Assam and in 1842 in Ceylon. Since 1873 these regions have produced great quantities. In Java the cultivation of tea began in 1830, but not with any great success before 1880. At present it is of great importance in the Preanger Districts in Java, both as a native occupation and on European plantations. It is also advancing in Sumatra.



The old "East-Indian House" at Amsterdam.

The export of tea from Java amounted in :

1885 to 2,423 tons.

1905 „ 11,859 „

1910 „ 15,338 „

1913 „ 25,061 „

The export of Java tea in 1913 comprised 11,710 tons to The Netherlands, 7,223 tons to Great Britain, 2,009 tons to Russia, 1,940 tons to Australia and 128 tons to the United States.

The course of the tea trade in The Netherlands was as under:

Tea trade in metric tons.

	Import.	Export.	Excess Import.
1847—56.....	1,068	18	1,050
1857—66.....	1,285	27	1,258
1867—76.....	1,736	26	1,710
1877—86.....	2,131	40	2,091
1887—96.....	2,682	16	2,666
1897—1906.....	3,629	16	3,613
1913.....	5,463	14	5,449

The above figures concern the special trade; the general import and export is larger, as shown by appendix II.

The tea dealt in this country is mainly the Java product. Tea from other countries is imported from London. The Netherlands tea trade is mainly carried on at Amsterdam, but, to some extent, also at Rotterdam. The arrivals of tea are appraised, weighed and registered in the tea establishments at Amsterdam and sold in public auctions.

The tea sold goes chiefly to Great Britain, Germany, the United States and other countries.

TOBACCO.

After sugar, this is the most important product of the Netherlands East Indies, where it is cultivated in Java and

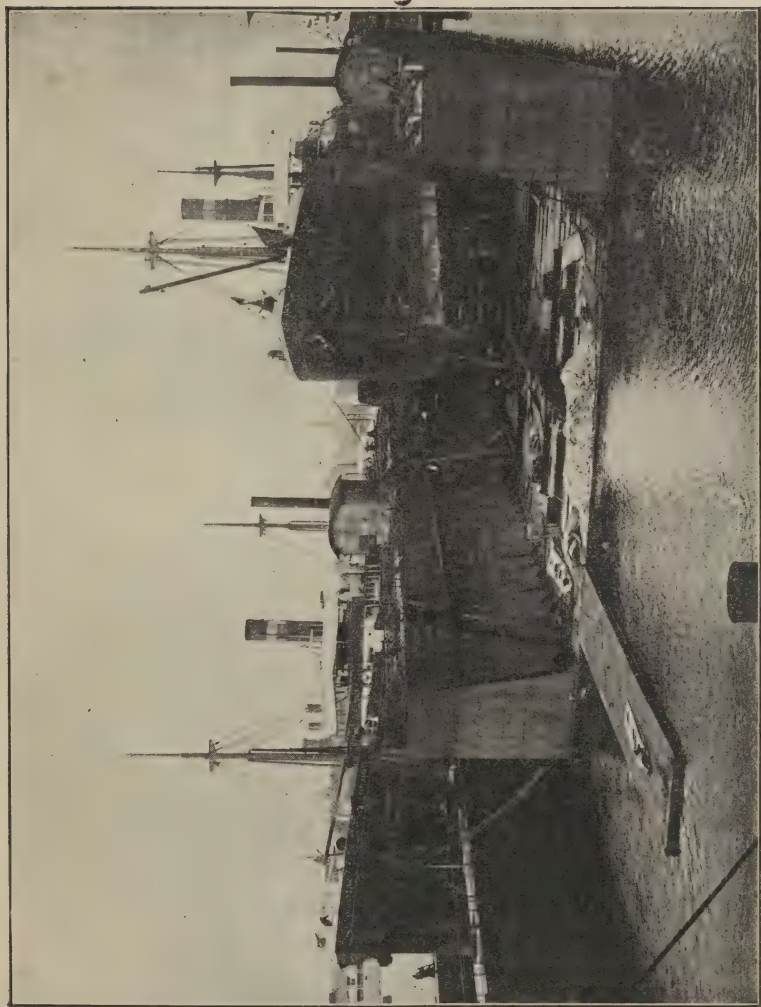
Sumatra. By its fine quality the tobacco from Java and Sumatra commands an important place in the world's market, especially for the manufacture of cigars. The Indian cultivation of tobacco is of eminent importance for the national trade, as the product is almost entirely sold here. The markets of Amsterdam and of Rotterdam owe their world wide renown to the Sumatra and Java tobacco. The Netherlands tobacco market, that flourished in the 18th century and afterward declined, revived again owing to the import of Indian tobacco, which increased continually, especially after 1860.

The scale of Indian tobacco in The Netherlands is shown in the appended table:

	Sumatra tobacco	Java tobacco.
1861	4 tons	5,400 tons
1871	304 "	11,610 "
1880	4,945 "	13,500 "
1900	16,996 "	21,690 "
1910	20,748 "	41,220 "
1912	21,280 "	63,630 "

The tobacco sold in the Netherlands market mainly comes from India, but some is imported from the United States and from Germany. It is sold by public tenders, principally at Amsterdam, and also at Rotterdam. In 1913 the sale of the Sumatra crop produced 24 million Dollars and the Java crop 12 million Dollars. Borneo tobacco comes only from British Borneo. Sumatra and Java tobacco is bought here by Germans and Americans. This sort is not equalled by any other for covering leaf.

The tobacco trade in this country has called to life a fairly important tobacco industry. No less than 515 cigar factories are at work here, of which 154 are in North Brabant, 94 in North Holland, 88 in South Holland, and the remainder in the other provinces. Further, there are 12 cigarette factories, 162 tobacco-cutting works, &c.



Wilhelmina-dock at Amsterdam,

Hence The Netherlands had in 1913 an export of 2,137 tons of cigars and 45 tons of cigarettes, distributed over all smoking countries. Of cut tobacco there were exported 4,573 tons.

RICE.

Since about 1850 rice has become more and more an article of consumption in the countries of the temperate zone, especially in Europe. The total imports and exports in and from The Netherlands ran as follows:

	Import (tons).	Export (tons)	Excess import(tons).
1847—56 (average yearly)	34,000	9,000	25,000
1857—66 "	41,000	15,000	26,000
1867—76 "	62,000	19,000	43,000
1877—86 "	95,000	36,000	59,000
1887—96 "	134,000	43,000	91,000
1897—1906 "	202,000	98,000	104,000
1910 "	351,000	204,000	147,000
1913 "	408,208	225,369	182,839

Most of the rice imported in The Netherlands comes from British India, which supplied us with 281,183 tons in 1913, the Netherlands East Indies further sending 43,090 tons and Siam 43,458 tons.

The rice is mainly imported unhulled or insufficiently hulled. There is an extensive rice industry in this country for hulling and polishing the rice and making it fit for use. The hulling works are chiefly found in the Zaan district, at Wormer, Wormerveer and Zaandam, and also at Amsterdam, Rotterdam and Zwyndrecht. Owing to this rice industry The Netherlands have a considerable export of hulled rice. The total export amounted in 1913 to 225,369 tons, viz.: to Germany 53,325 tons, to Great Britain 37,446 tons, to the United States 21,820 tons and to Portugal 16,763 tons.

CASSAVA AND TAPIOCA.

Cassava is a tuberous root from tropical America which was introduced in the Netherlands East Indies in 1851 and owing to the Government's encouragement, became a native culture. The cassava produces an excellent flour, tapioca flour, used amongst other things for making biscuits and for many other purposes. The production of tapioca has been largely on the increase of late years. The export of tapioca flour from Java amounted in 1911 to 38,949 tons and in 1913 to 53,234 tons. This export goes mainly to the United States and further to England, the Netherlands East Indies and Singapore.

About 52,786 tons of tapioca were imported in The Netherlands in 1913, nearly all from the Netherlands East Indies, while in 1906 it only amounted to 9,125 tons. The export amounted to 48,305 tons, of which 23,414 tons went to North America and 21,556 tons to Great Britain.

BENZINE.

The Netherlands Indian petroleum industry supplies the mother country with practically nothing but benzine. In 1913 the Indian possessions outside Java sent home 4,291,172 gallons of benzine. There is a large benzine distillery and refinery in Rotterdam, which treated 123,000 tons in 1913. These works produce chiefly light benzine. Besides at home, the product meets with a demand in Germany, England, Scandinavia and Switzerland.

TIN.

The tin mines in Banka (Netherlands East Indies), which are worked by the Government, and in Billiton, worked by the Billiton Company, send a considerable amount of tin to the Netherlands market. In 1913 imports amounted to 22,124 tons, of which 15,641 came from the Netherlands East Indies and 3,926 from Great Britain. The export amounted to 18,787 tons, of which 11,952 tons went to Germany, 2,605 to Russia and 1,373 to Great Britain.

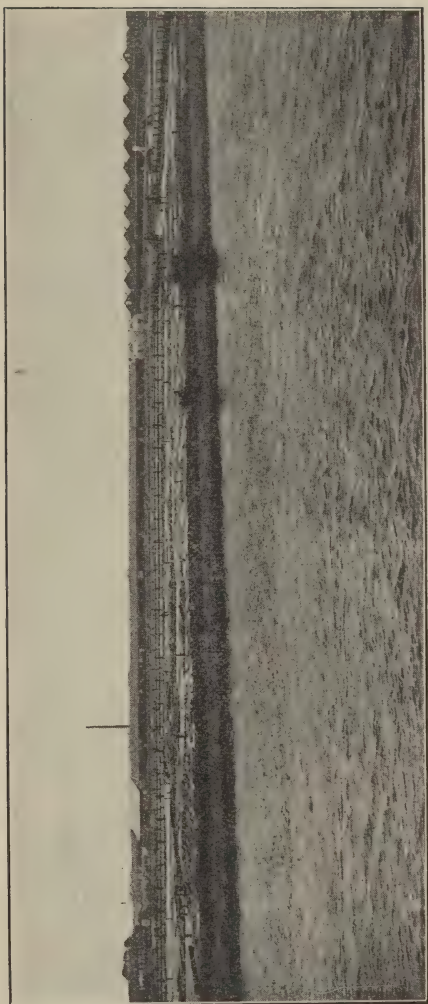
C. SUNDRY COMMODITIES.

The number of commodities that only appear in this country as articles of commerce is a very large.

The Netherlands, the centre of the most important manufacturing and commercial countries of Europe, possessed of fine harbours and extensive hinterlands on the Rhine and the Scheldt, as also of excellent means of conveyance by regular liners and tramp vessels, of rich tropical colonies and an active commercial population, was destined by its geographical position and soil and the nature of the inhabitants, to carry on a lively trade. Many articles are imported here in large quantities and thence distributed, either in transit or by sale. Some articles that are subject to further treatment here, we have already mentioned. Other leading articles may be here recalled, as follows :

CEREALS.

Cereals are not only the oldest commodity of The Netherlands, but still maintain the first rank as regards import and export ; amounting, according to value, to as much as 20 per cent of imports and nearly 17 per cent of exports. The trade in cereals originated here in olden times because the low lands of Holland, already densely peopled, could not produce sufficient grain to feed the population. The import very soon led to trade. At that time the cereals were imported from the land situated south and east of the Baltic and also from the countries on the Rhine. When in the latter part of the 16th century The Netherlands began to sell the cereals from the Baltic to the South European countries, Amsterdam very soon became the greatest international market for cereals, whence Europe had to be supplied in times of a failure of crops. This position Amsterdam occupied up to the end of the 18th century. Afterwards the international trade in cereals was for a good while entirely governed by England, while it diminished in this country. Added to this, the harbour of Odessa began to export more grain after 1817. A new route was thus opened by the Black Sea and the Mediterranean for the conveyance of cereals, and Netherland's inter-



The "Houthaven" (timber harbor) at Amsterdam.

mediary in supplying Southern Europe with the article came to an end. But a revival of the grain trade occurred in this country in 1870, when Germany began to import grain and The Netherlands, owing to increased cattle-rearing and manufactures, were also more and more in want of the article. The rise of North America as a producer of grain in the sixties of the 19th century, offered a new source of supply to the Netherlands grain trade, which first obtained its supplies from the United States, later from Argentina and finally also from Canada.

The grain trade was now mainly carried on at Rotterdam, which, owing to the favourable position of its harbour, very soon became the first corn market of The Netherlands, while Amsterdam held the second place. For the inland grain-trade the principal market is Groningen. Most of the rural towns, which half a century ago were still getting grain from the neighbourhood of their markets, have seen these markets dwindle away and foreign grain is almost everywhere imported on a large scale.

The grain trade has been largely extended in the last few decades by this process both as regards national and international requirements.

At present wheat takes the first place among the grains of our trade. This trade has taken a gigantic flight in little more than half a century. A few figures will show this.

Trade in wheat, in metric tons.

	Import.	Export.	Excess Import.
1847—56 (annual average)	36,000	30,000	6,000
1857—66 "	51,000	25,000	26,000
1867—76 "	110,000	24,000	86,000
1877—86 "	460,000	239,000	220,000
1887—96 "	705,000	441,000	264,000
1897—1906 "	1,231,000	973,000	258,000
1910 "	1,933,000	1,586,000	346,000
1913 "	2,160,085	1,730,877	429,208

Wheat is mainly imported from the United States, viz. to the extent of 835,679 tons, Southern Russia sending 572,999 tons, the countries on the Rio de la Plata 304,653 tons, and Roumania 58,805 tons.

The export goes mainly to Germany by way of the Rhine. The Netherlands have a large deficiency of wheat, so that 429,208 tons of the import were reserved for inland consumption.

The import of wheat flour is also very large, it being much increased for lack of sufficient grinding capacity at home.

Wheat flour, in metric tons.

	Import.	Export.	Excess Import.
1867—76 (annual average)	22,000	4,000	18,000
1877—86 „	30,000	8,000	22,000
1887—96 „	91,000	17,000	74,000
1897—1906 „	164,000	11,000	152,000
1913	200,835	17,837	182,998

Rye flour, in metric tons.

	Import.	Export.	Excess Import.
1867—76 (annual average)	1,423	130	1,293
1877—86 „	16,317	9,920	6,397
1887—96 „	35,037	18,857	16,180
1897—1906 „	44,206	27,591	16,615
1913	109,914	88,570	21,344

The wheat flour comes chiefly from the United States, viz. in 1913 92,122 tons, and further from Germany and Belgium. The export goes mostly to Germany.

The import of rye amounted in 1913 to 631,345 tons. It comes principally from Russia and especially from the Black

Sea harbours, and also from the Baltic and from Germany. The export of rye amounted in 1913 to 363,598 tons, mostly to Germany. An important part of the export to Germany went by way of the Rhine, and consisted of grain imported from German ports on the Baltic, the conveyance by water being cheaper than by land. The import and export of rye flour is shown in the foregoing statement. It nearly all comes from Germany, where a considerable production of rye is supported by an ample grinding capacity, while rye flour is also imported in Germany, partly coming thence by another way.

The import of maize is very considerable, amounting in 1913 to 1,002,507 tons. It is drawn principally from the lands on the Rio de la Plata, namely, 542,047 tons in 1913; from the United States, 188,998 tons; from Russia 94,593 tons; from Roumania, 82,146 tons and from Java 47,225 tons. The export of maize amounted to 300,904 tons, leaving an excess import of 701,603 tons, which serves for sundry manufactures and for fodder. The export is mainly directed to the German hinterland. Maizeflour is not imported here.

Of oats there were imported in 1913 561,888 tons, viz., from Russian harbours on the Black Sea 216,907 tons, from the countries on the Rio de la Plata 170,583 tons, and from Germany 88,277 tons. The export of oats amounted to 451,869 tons, leaving an excess import of 111,019 tons for home consumption. The main export is directed to Germany viz., 423,545 tons and Belgium getting 22,448 tons. The Netherlands produce some malt, but not enough for our own requirements. In 1913 the import of malt amounted to 64,506 tons, mostly from Great Britain, the United States and Germany; whilst the export amounted to 5,932 tons, mainly to Germany, thus leaving an excess import of 57,574 tons.

ORES.

The Netherlands soil produces hardly any ores fit for trade. Only small quantities of iron ore are dug in the marshes of the eastern provinces and exported to Germany. There is, however, an important transit trade of ores to Germany, which has largely expanded since 1877. The ores are not

only conveyed up the Rhine in transit, but a very important oretrade is being carried on at Rotterdam by the owners of mines in France, Spain, Algeria and Morocco, Greece and Sweden, managing the whole business of mining, selling and transporting.

The most important is the trade in iron ore, of which 8,745,432 tons were exported in 1913, mainly by the Rhine to Germany. Among the ores are: Black oxide, ferric oxide, clay ironstone and ferrous carbonate. Further, manganese, copper ore, lead ore, tin ore, nickel ore, chrome ore, &c., are dealt in.

COAL.

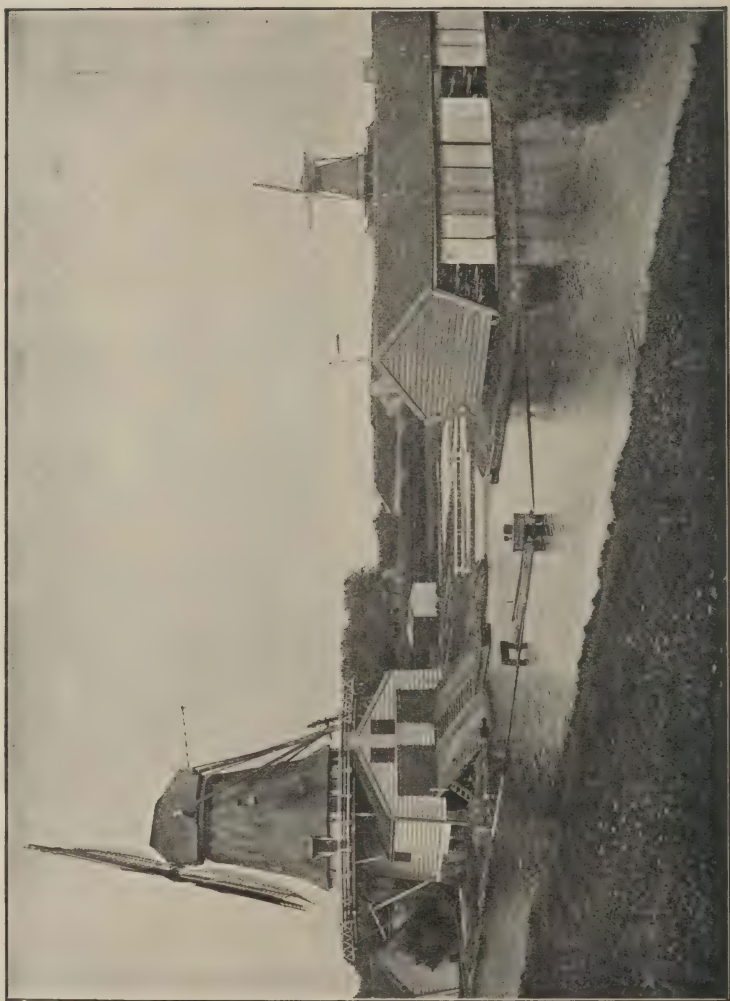
The Netherlands possess coalmines in Southern Limburg. In consequence of the geographical position of these mines in a distant corner of the country, the coal is under normal circumstances chiefly exported to Germany and Belgium and only for a small part appropriated to home use. The bulk of the coal consumed in The Netherlands is mainly imported from Germany, in 1913 to the amount of 11,446,579 tons, whilst from Great Britain came 2,018,814 tons and from Belgium 269,415 tons.

The export of coal amounted in 1913 to 5,470,814 tons, leaving an excess import of 8,264,029 tons. The export goes to Germany, 1,106,358 tons; Belgium, 1,051,794 tons; and further to several countries in consequence of the shipping traffic of Rotterdam. This export consists partially of Netherlands coal, and partially of coal bought and sold here, i. e., German coal sent to different countries, and British coal in demand in Germany.

The production of the Netherlands coalmines amounted in 1913 to 408,989 tons from the Government mines and 1,365,150 tons from private mines.

THE TIMBER TRADE.

The Netherlands have long had an important timber trade. The country has comparatively but few woods, while much timber was continually required for considerable ship-building and for piling foundations in the marshy soil under



Wind-mill on the Zaan.

the houses. Formerly, Germany supplied much timber, that was rafted down the Rhine, but since 1880 Germany herself is bound to get a supply from abroad. This resulted for The Netherlands in a timber trade not only to provide for our own requirements but also for those of other countries. In 1913 The Netherlands had an import of 2,756 tons (of 1,000 Kilograms) of shipwright's and carpenter's timber and an export of 1,194 tons, leaving an excess import of 1,562 tons. The demand for shipwright's timber has largely diminished owing to the rapidly increased use of iron in naval architecture, but the growing population and their housing, the railways and the raw material for paper mills continually demand more wood.

The shipwright's and carpenter's timber are mainly imported from Russia (Baltic and White Sea), Sweden, Germany, the United States and Java. The export goes principally to Germany and Belgium.

Further, there is in this country some trade in fine wood for cabinet-work; in 1913 there was an import of 50,000 tons and an export of 25,000 tons. Dyewood was also imported to an amount of 41,436 tons, the export amounting to 24,796 tons.

The timber trade is centred mainly at Zaandam, Amsterdam and Rotterdam; the sawing of timber at Zaandam.

Further particulars concerning the trade in sundry articles are to be found in the annexed Statement.

NETHERLANDS TRADE AND RELATIONS WITH AMERICA.

The Netherlands have entertained trade relations with North America since the beginning of the 17th century. Merchants from Amsterdam began a bartering trade with the Indians on the Hudson river in 1609, who supplied them principally with furs and timber. This trade was transmitted to the West Indian Company and more especially to the Amsterdam section of that Company. This body succeeded in founding colonisation on the Hudson. Agriculturists and merchants settled there, and so originated a colony called

New Netherland and a town called New Amsterdam. In 1664 the Netherlanders were obliged to cede this colony to England in behalf of the Duke of York, after which the town of New Amsterdam and also the Colony received the name of New York. But though this put an end to the dominion of The Netherlands, the old Netherlands colonists have left behind a series of patrician generations, whose names still have an agreeable sound in the American Union. Many political principles of Netherlands origin have been imported by them and have struck root in America.

In the 19th century The Netherlands still supplied a pretty considerable quantity of immigrants to America, in all about 209,000. Settlements of Netherlanders are still to be found in many places, amongst others at Patterson (N. Y.), Chicago (Ill.), Rochester, New York, Grand Rapids, Michigan and California.

Trade relations with America have been kept up since the re-establishment of the independence of The Netherlands in 1814.

Seventy-three vessels, measuring 16,665 tons, cleared from this country to America in 1828. In the second half of the 19th century this trade relationship grew more intense. In 1850 the total turnover (import and export, as shown by the Netherlands statistics) between this country and America, amounted to 3,21 million Dollars; in 1870 to 5,34 million Dollars; in 1890 to 45,88 million Dollars and in 1912 to 173,88 million Dollars.

This country is especially a buyer from America; the import from there in 1913 surpassed the export thither by 125 million Dollars.

America supplies us principally with grain, viz.: wheat and wheat flour, oats, maize, barley, and further seedcakes, lard, oleo-oil, timber, copper, petroleum, cotton, turpentine, cottonseed-oil, chemical manure, tobacco, iron and steel ware, tools, pork, &c.

This country exports mainly to North America: hides, tapioca, tin, wool, &c Several articles of Netherlands manufacture or trade are sent from here to America. They are mentioned in the annexed statement.

The trade between The Netherlands and America during the last 50 years is shown in an accompanying statement. (Appendix III).

The extension of the trade has involved a proportionate increase of traffic in the last few years. In 1902 429 vessels measuring 1.677,000 tons were entered here from America and in 1913 551 vessels measuring 1.975,000 tons.

COUNTRY

In 1

(11,828),
(1,126).

States (8
Plata (30

24,171),
a (80,922

64,448),
(68,046

Plata (54
a (82,146

18,245),
(89,352)

rica (38,
in (6,287

yana (9

tates (27

(17,447,
(7,640),

1,140,11
135,672),
41,414),

(136,34'
29,166),

(675,61'
in (25,5'

3,783), (4,
(4,778).

(7,113).

(116,925
tates (1

(156,29
in (6,17

(41,599

5,399),

(11,446
269,413

GENERAL COMMODITIES.

IMPORTED AND EXPORTED IN 1913.

ARTICLES OF IMPORT.	Import	Excess of import	COUNTRIES OF ORIGIN. In metric tons	ARTICLES OF EXPORT.	Export	Excess of export	COUNTRIES OF DESTINATION. In metric tons.
	in metric tons.				in metric tons.		
Cocoanut oil	16,686	+ 113,10	Germany (11,828), France (1,861), Belgium (1,126).	Cocoanut oil	5,376	—	Germany (4,403), Belgium (576).
Wheat	2,160,085	+ 428,208	United States (835,679), Russia (716,797), Rio de la Plata (304,653), Roumania (143,797).	Wheat	1,731,877	—	Germany (1,621,091), Belgium (109,105).
Rye	631,345	+ 267,747	Russia (324,171), Germany (109,348), Roumania (80,922), Rio de la Plata (14,076).	Rye	363,598	—	Germany (334,257), Belgium (28,246).
Barley	887,043	+ 191,368	Russia (664,448), Germany (80,287), Germania (68,046), United States (29,370).	Barley	696,575	—	Germany (631,116), Belgium (64,864).
Maize	1,002,507	+ 701,603	Rio de la Plata (542,070), Un. States (188,988), Roumania (82,146), Neth. E. Indies (47,225).	Maize	300,904	—	Germany (272,552), Belgium (23,960).
Oats	561,888	+ 110,019	Russia (218,245), Rio de la Plata (170,583), Germany (89,352), United States (37,384).	Oats	451,869	—	Germany (423,799), Belgium (22,448).
Ground and Ivory nuts	67,428	+ 48,265	West Africa (38,582), China (6,556), Gr. Britain (6,287), Belgium (6,270).	Ground and Ivory nuts	19,163	—	Germany (16,008), United States (1,818).
Gutta percha, raw. . .	2,034	—	Neth. Guyana (915), Neth. E. Indies (771).	Gutta percha, raw. . .	2,707	+ 673	Germany (1,428), Gr. Britain (995).
Resin and galipot. . .	36,039	+ 8,953	United States (27,622), France (7,347).	Resin and galipot . . .	27,086	—	Germany (20,863), Neth. E. Indies (3,861).
Hides, skins	52,006	+ 15,881	Germany (17,447), Gr. Britain (10,585), Belgium (7,640), Neth. E. Indies (6,177).	Hides, skins	36,125	—	Germany (19,054), Belgium (4,903).
Iron ore	8,622,287	—	Sweden (1,140,110), Russia (746,591), Spain (3,135,672), Norway (1,742,579), France (541,414), Algeria (404,529).	Iron ore.	8,745,432	+ 123,145	Germany (8,708,212), Belgium (15,500).
Iron (pig)	325,025	+ 70,785	Germany (136,347), Gr. Britain (132,329), Sweden (29,166), Belgium (17,678).	Iron (pig)	254,240	—	Belgium (91,638), Germany (79,416). Gr. Britain (51,923).
Wrought iron	765,896	+ 338,631	Germany (675,619), Belgium (56,476), Gr. Britain (25,537), Sweden (6,627).	Wrought iron	427,265	—	Gr. Britain (217,161), Germany (80,930), Norway (32,264).
Copper ore	377,898	—	Spain (363,783), Germany (3,442), Portugal (4,778).	Copper ore	386,216	+ 8,318	Germany (381,783), United States (2,284).
Lead ore	8,467	—	Australia (7,113).	Lead ore	16,975	+ 8,508	Belgium (9,934), Germany (6,928).
Zinc ore	183,232	+ 104,431	Belgium (116,925), Australia (39,387), United States (19,587).	Zinc ore	78,801	—	Belgium (48,988), Germany (27,445).
Steel, in sheets and bars	234,958	+ 121,701	Germany (156,294), Belgium (67,901), Gr. Britain (6,175).	Steel, in sheets and bars	113,257	—	Gr. Britain (90,927), Neth. E. Indies (4,436).
Colors, unprepared. . .	58,428	+ 13,523	Germany (41,599), Br. India (2,886).	Colors, unprepared . .	44,905	—	Germany (15,992), Gr. Britain (13,230), Belgium (6,031).
Soyabeans	27,554	+ 13,132	Siberia (25,399), Belgium (1,955).	Soyabeans	14,422	—	Germany (11,865), Belgium (2,520).
Coals.	13,734,843	+ 8,264,030	Germany (11,446,579), Gr. Britain (2,018,841). Belgium (269,415).	Coals	5,470,813	—	Germany (1,106,358), Belgium (1,051,794). France (978,281).

MODITIES.

RT IN 1913.

al countries in metric tons.	Total export in metric tons.	Principal countries of export in metric tons.
(11,604). ain (9,461). (8,515). (020). (1,860).	13,211	Prussia (8,083). Hamburg (1,292). Gr. Britain (1,120).
(8,941). (1,030).	82,356	Hamburg (38,498). Prussia (26,728). Bremen (7,145).
n (1,459) (1,172).	5,610	Gr. Britain (1,557). Hamburg (1,052). Prussia (819).
	6,159	Prussia (2,056). United States (1,268). Bremen (1,199).
ca (38,582). (56). (3,270). n (6,286). (6,269).	19,163	Prussia (15,800). United States (1,818).
,875). n \$ 448,400.	\$ 157,820	Belgium \$ 141,600.
(2,921). (2,916). n (2,724).	10,989	Prussia (6,977). United States (1,053).
	4,663	Germany (2,099). United States (1,637).

THE LIBRARY
OF THE
BUREAU OF COMMERCE
WASHINGTON, D. C.

COLOMBIA: COMMODITIES
August 1964 through July 1973

Commodity	Value (millions of dollars)	Imports (millions of dollars)	Exports (millions of dollars)	Balance (millions of dollars)	Notes
1. Coffee	1,000	1,000	0	0	Includes coffee beans and coffee products
2. Bananas	1,000	1,000	0	0	Includes banana fruit and banana products
3. Sugar	1,000	1,000	0	0	Includes sugar cane and sugar products
4. Oilseeds	1,000	1,000	0	0	Includes soybeans and other oilseeds
5. Grains	1,000	1,000	0	0	Includes wheat, corn, and other grains
6. Meat	1,000	1,000	0	0	Includes beef, pork, and other meat
7. Fish	1,000	1,000	0	0	Includes fish and fish products
8. Fruit	1,000	1,000	0	0	Includes apples, oranges, and other fruit
9. Vegetables	1,000	1,000	0	0	Includes potatoes, tomatoes, and other vegetables
10. Beverages	1,000	1,000	0	0	Includes beer, wine, and other beverages
11. Textiles	1,000	1,000	0	0	Includes cotton, wool, and other textiles
12. Metals	1,000	1,000	0	0	Includes iron, steel, and other metals
13. Machinery	1,000	1,000	0	0	Includes electrical machinery, transport machinery, and other machinery
14. Chemicals	1,000	1,000	0	0	Includes fertilizers, pesticides, and other chemicals
15. Miscellaneous	1,000	1,000	0	0	Includes other commodities not classified elsewhere
Total	15,000	15,000	0	0	

AMERIC

RS.

YEAR

Steel in
sheets, etc.

12

1850 5 —

1855 9 —

1860 8 —

1865 — —

1870 — —

1875 0 —

1880 5 —

1885 2 —

1890 2 —

THE LIBRARY
OF THE
BUREAU OF MINES

IMPORT INTO THE NETHERLANDS FROM THE UNITED STATES OF NORTH AMERICA, ACCORDING TO THE NETHERLANDS' STATISTICS.

IN THOUSANDS OF DOLLARS.

YEARS. TOTALS.	Copper ¹⁾ .		Wheat.	Seedcakes.	Timber (sawn) ²⁾ .	Wheat-flour.	Lard.	Margarine (raw).	Petroleum a. o. min. oil.	Oats.	Cotton ³⁾ .	Timber (unsawn) ⁴⁾ .	Turpentine.	Cottonseed oil.	Maize.	Ironware ⁵⁾ .	Vinegar.	Animal bladders.	Chemical manure.	Tobacco.	Implements (machinery etc.).	Hides and leather.	Steel in sheets, etc.	Resin and galipot.	Pork ⁶⁾ .	Wax ⁷⁾ .	Cabinet-makers-wood ¹¹⁾ .	Malt.	Starch.	Hair.	Barley.	Staves (rough).	Apples a. o. fruit.	Linseed.	Paints.	Stearine.	Zinc-ore.	Chemicals.	Broken cereals.	Tools ¹²⁾ .	Sponges.	Rye.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41		
1850	1,762	—	—	—	6	2	120	—	—	—	242	11	20	—	—	4	—	—	—	870	—	5	—	13	—	—	26	—	—	—	—	53	—	—	8	—	—	—	—	—	—	—	4
1855	2,260	—	—	—	17	1	13	—	—	—	613	24	3	—	—	—	—	—	—	1,003	—	9	—	150	1	—	15	—	—	—	4	40	—	—	6	—	—	—	—	—	—	—	59
1860	4,438	—	8	—	3	44	8	—	—	—	1,368	—	85	—	—	—	—	4	2	1,719	—	78	—	323	—	2	32	—	—	—	—	113	8	—	10	—	—	—	—	—	—	—	—
1865	1,119	—	—	—	3	9	14	—	138	—	—	15	3	—	—	4	—	—	—	708	—	—	—	4	—	2	16	—	—	—	—	72	—	—	41	—	—	—	—	—	—	—	—
1870	4,169	—	363	—	3	173	1	119	—	1,121	—	1,225	16	9	—	6	—	—	—	659	—	—	—	186	—	—	5	—	—	—	—	57	2	—	39	—	—	—	—	—	2	—	8
1875	8,580	46	12,622	—	38	13	1	649	—	2,366	—	2,050	39	209	—	4	—	4	—	670	16	100	—	398	22	—	—	—	24	—	—	50	37	—	72	—	—	—	—	10	—	—	
1880	32,524	29	13,316	—	85	1,631	1	4,103	—	4,230	—	3,855	21	157	2	8	—	9	—	77	—	—	—	540	727	—	9	—	154	5	—	65	61	—	38	384	—	19	—	35	—	614	
1885	22,243	1,264	2,957	—	100	1,034	1	4,132	—	6,881	19	1,308	58	613	2	6	—	12	—	138	—	—	—	531	182	4	48	—	186	45	—	134	118	80	99	127	—	—	—	39	38	262	
1890	39,376	308	626	159	324	4,717	1	11,742	—	8,796	169	1,572	50	925	1,517	2,574	26	—	231	—	918	51	192	—	692	1446	185	125	—	190	5	24	163	56	—	82	350	—	—	—	44	—	24
1895	44,345	8,387	3,144	691	256	4,776	1,843	4,493	3,971	—	1,314	132	1,548	1,170	2,687	86	—	1,713	92	1,255	62	160	6	839	307	137	95	—	278	37	—	308	185	—	75	—	—	9	58	61	—	29	
1900	113,403	15,037	11,232	2,519	1,450	12,659	4,796	8,006	4,489	1,224	3,016	2,553	2,182	1,696	13,209	1,858	—	2,033	85	1,442	1,064	500	1,211	757	1,094	876	434	160	602	29	1,026	414	379	1,225	94	522	537	11	166	185	144	169	
1905	96,266	25,021	2,052	5,329	2,340	6,710	6,231	8,706	4,835	1,181	2,303	799	1,234	1,844	5,622	1,100	660	1,755	1,007	1,140	933	433	12	956	1,043	444	424	154	220	—	203	571	350	396	283	547	471	52	212	225	151	4	
1910	118,096	41,542	4,255	7,081	5,309	7,849	2,014	3,407	4,314	—	1,382	1,905	1,507	1,382	4,026	804	1,677	1,532	1,240	1,405	1,099	1,736	76	719	178	622	569	905	1,250	104	215	497	412	102	212	330	305	25	151	422	212	—	
1912	144,800	30,640	25,253	8,324	7,104	6,955	6,212	4,547	4,220	3,812	3,453	3,194	3,055	2,640	2,420	2,106	1,868	1,775	1,681	1,462	1,461	1,309	1,037	856	851	794	756	660	618	636	615	616	596	522	486	386	361	284	266	265	208	53	
1913	177,093	33,969	43,455	8,965	7,293	11,055	4,990	4,601	4,536	1,196	3,224	4,076	3,784	2,807	4,913	1,662	1,857	1,506	1,977	1,533	1,903	1,419	95	884	342	2,094	920	682	852	436	940	884	411	1,230	369	484	392	457	424	303	171	440	

¹⁾ including grease and tallow.²⁾ beech oil, poppy-oil etc.³⁾ flour of various cereals.⁴⁾ guano.⁵⁾ copper, red, raw and refined; copperware and chips.⁶⁾ timber, shipwright's and carpenter's.⁷⁾ cotton, unspun.⁸⁾ ironware, pipes and tubes cast, wrought, forged; nails and spikes.⁹⁾ Pork — salted, smoked and dried; the first years including mutton.¹⁰⁾ wax; bleached and unbleached; including vegetable wax.¹¹⁾ sawn and unsawn.¹²⁾ tools of various metals including agricultural implements.

EXPORT FROM THE NETHERLANDS TO THE UNITED STATES OF NORTH AMERICA ACCORDING TO THE NETHERLANDS' STATISTICS.

IN THOUSANDS OF DOLLARS.

YEARS.	TOTALS.	Hides in leather.	Tapioca.	Tin (rough and wrought).	Wool (all sorts).	Cotton (unspun).	Rice.	Flowerbuds.	Cocoa-butter.	Chemical manure.	Chemicals ¹⁾	Copper ²⁾	Potato flour.	Rice-flour.	Carpets.	Seeds.	Cocoa-powder.	Cheese.	Prints.	Coffee.	Aluminium ware.	Flax.	Gutta percha (raw).	Fish ⁴⁾	Irons.	Live plants.	Rubber.	Cocoa-kernels.	Vegetable fibers.	Glycerine.	Indigo.	Oils.	Line.	Zinc (rough).	Paper (all sorts).	Chocolate.	Kapok.	Cork.	Sugar.	Madder.	Hops.	Earthen tobacco pipes.						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41						
1850	1,849	—	—	132	—	—	—	7	—	—	—	—	—	—	—	23	—	4	—	169	—	22	—	6	1	vide col. 7	—	—	—	—	—	—	78	—	—	—	—	—	—	—	502	313	—	9				
1855	1,253	—	—	134	—	—	—	10	—	—	4	—	—	—	—	—	—	4	3	204	—	24	3	10	—	—	—	—	—	—	14	4	—	3	—	—	—	—	—	—	110	414	—	30				
1860	1,903	—	—	238	3	—	—	11	—	—	6	—	—	—	—	—	—	4	—	82	—	51	—	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	61	124	—	40				
1865	1,773	3	—	133	54	—	—	2	—	—	2	—	—	—	—	12	—	14	15	185	—	92	—	28	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	45	806	—	8				
1870	1,170	19	—	21	—	—	—	³⁾ 6	—	—	6	—	—	—	—	11	—	8	27	12	—	29	—	7	150	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	187	—	7			
1875	1,704	—	—	22	—	—	—	³⁾ 22	—	—	24	—	—	—	2	14	—	33	131	24	—	54	—	40	212	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	486	—	11		
1880	6,274	290	—	154	—	—	—	³⁾ 21	—	—	16	28	—	—	—	5	—	28	214	20	—	2	16	70	3,468	—	—	—	—	—	—	—	—	—	3	5	—	—	—	—	—	—	—	—	—	60	—	3
1885	10,247	54	—	371	—	14	463	³⁾ 54	—	—	26	9	—	—	—	32	3	43	197	347	—	56	117	293	1,386	—	—	—	—	—	—	—	—	2	—	2	—	—	—	—	—	—	—	—	—	—	3	
1890	6,507	52	—	342	—	—	56	³⁾ 177	—	—	40	—	—	—	—	49	92	84	279	325	—	60	5	216	637	—	—	—	—	—	—	—	—	2	—	2	—	—	—	—	—	—	—	—	—	—	4	
1895	7,048	283	—	1,530	15	—	93	³⁾ 234	—	—	150	—	—	—	—	80	127	156	173	376	—	19	—	301	401	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1900	10,038	943	—	745	499	15	96	³⁾ 448	—	—	125	28	—	—	—	108	149	296	268	238	—	59	—	416	80	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
1905	13,463	1,048	136	202	412	97	119	481	—	114	525	48	34	—	—	235	105	347	160	271	—	97	28	488	1,734	128	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1910	22,016	1,483	1,207	829	133	332	1,709	711	644	380	357	23	24	381	96	275	163	444	427	325	15	196	—	520	714	341	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1912	29,033	2,362	1,373	1,584	1,177	1,112	932	915	739	578	569	532	504	492	480	450	471	463	384	354	333	328	312	304	284	294	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1913	32,224	2,124	2,809	300	1,029	132	2,618	1,299	798	1,172	604	453	393	543	541	771	342	465	503	430	186	154	6	658	434	380	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

¹⁾ Of all sorts.²⁾ To be added column 25 (live plants).³⁾ Copper ore, red copper rough and refined, copperware and chips.⁴⁾ Fish, herring, stock-fish and all other sorts of fish, smoked or salted.⁵⁾ Not returned separately

FISHERIES IN THE NETHERLANDS

BY

P. G. VAN TIENHOVEN.



Zoölogical Station at Den Helder. ("Wonderkuil" in foreground).

N 471.8
no. 9

FISHERIES IN THE NETHERLANDS

BY

P. G. VAN TIENHOVEN.

THERE is no pretence at completeness in this sketch of the Netherlands Fisheries. It is intended to give no more than a slight idea of this branch of national prosperity, so vitally important for The Netherlands, and to attract the reader's attention to a few salient points, which will give him an impression of what the fisheries mean to this country.

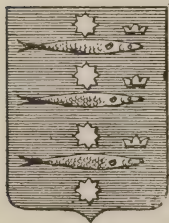
The water has ever been The Netherlands' greatest friend and foe, and one glance at the map convinces us that next to Navigation, Fisheries were bound to constitute a source of prosperity. The North Sea encloses The Netherlands on two sides (on the North and the West), whilst in the country itself there is moreover the Zuyder Zee, covering an area of 357.000 H. A. (below Wieringen). This latter consists of brackish water and is of great importance for the enticing and catching of anchovies and other kinds of fish. Canals and rivers intersect the land, and in many places we find lakes and ponds, though the number of these has been greatly reduced by means of impoldering and draining. These diked-in polders testify to it, that The Netherlands justly bears the name of "waterland".

HISTORY.

Most prominent in the History of the Fisheries is the *Herring Fishery*, also called the *Great Fishery*, for the protection of which numerous measures were taken in the 16th century and after. This trade was introduced into Zeeland from Flanders; in 1163 the first herrings were caught and eaten in Holland. A radical change was brought about in the Great Fishery by the invention of *sousing* in the first half of the 14th century by WILLEM BEUKELSZ OF

BIERVLIET. By this process the gills and other internal organs are removed the moment the herrings are caught; they are then packed in barrels, between layers of salt. This sousing-process enables the Netherlands fishermen to go on with their work at sea, without having to put back to port after every catch, as the English fishermen do, who work so much nearer their base of operations.

The importance of the herring fishery, — *'s Lands Principaale Goudmijne*¹ as the old writers are fond of calling it — may be judged from the prosperity and wealth of the towns where this trade was carried on. Enkhuyzen, now one of the “villes mortes” of the Zuyder Zee, yet bears unmistakable traces of its former wealth, grandeur and prosperity, at a time when it ranked among the foremost fishing-towns. The stately town-hall, completed in 1688, vividly reminds us of the time when a fleet of 500 fishing smacks set out from this town alone.



Coat-of-arms
of Enkhuyzen.

Truly, Enkhuyzen's coat-of-arms, three herrings, one above the other, is well-chosen and appropriate. In its golden days Enkhuyzen counted 40,000 inhabitants, which number, after the decline of the fishing-trade in 1840, was reduced to 4988! (To-day the town has some 7000 inhabitants.)

It was a *fête* day when the first of the “New Herrings” came ashore, and the old saying,

“Haring in 't land
Dokters aan kant.”²

proves that, besides the economic advantages, the nutritive value of the herrings was also highly prized. Down to this day the fishmonger's shops are decorated with flags and ever-greens as soon as this delicacy is on sale again.

In the 18th century the herring-fishery began to decline, and in 1747 the number of fishing-smacks, which in 1601 amounted to 1500, had come down to 200. By means of

¹ The Chief Goldmine of the Country.

² Herrings in the land, no doctors needed.



The town-hall at Enkhuyzen.



View at the "Amsterdam train-oil boiling establishments" on Jan-Mayen-Island (1639).

premiums of *f* 500 per vessel, to be awarded for 12 years, an attempt was made to keep the failing trade going; but with no great success, for at the beginning of the 19th century the herring fishery fell off even more, and in 1813 only 3 smacks put to sea.

On the restoration of the independence of The Netherlands, the trade once more began to flourish. In 1814, 98 smacks put out; in 1830, as many as 173. Then followed a fresh decline, until in the middle of last century there was a revival of the sea-fisheries which brought that flourishing trade to the prosperity it enjoys at the present day.



The old "Krahnthor" at Dantzig, where in the middle ages the
Hollanders had their own herring-stores.

Whale-fishing, the so-called "*Little Fishery*", sprang up in the 17th century side-by-side with the herring fishery, and quite suddenly attained extraordinary prosperity. It was centralized in the "Noordsche Compagnie", which, established in 1614, consisted of "chambers" of the various

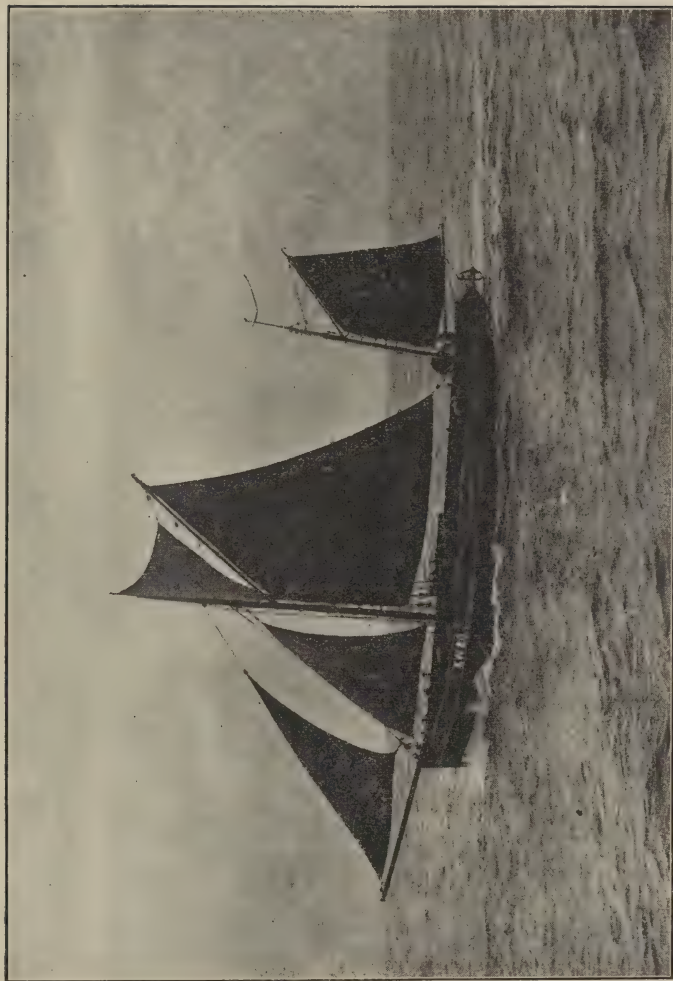
towns, carrying on the trade as a trust, or union of independent organizations. The actual purpose of the establishment of the "Noordsche Compagnie" was mutual cooperation, which would enable the trade successfully to cope with foreign competition, and if possible to oust the foreigner from the world-market, numerous disputes having arisen from time to time with England and Denmark, regarding the right of the Hollanders to fish far up in the North. The members of the Compagnie continued to have independent control of their own capital, and to fit out their own fleets. Annually they came to a mutual agreement as to the quantity of whalebone and train-oil they meant to obtain. The village of "Smeerenburg", a settlement on Spitzbergen, where the men wintered and stored their tools, had grown to a place of importance within the course of a few years; in 1633 it even possessed a church, and a fortress for defensive purposes. In 1645 the Compagnie was dissolved owing to lack of interest, and Smeerenburg ceased to exist.

Besides whales, this trade included the catching of walrusses and seals; how considerable the results often were, may be seen from the number of whales which an Amsterdam whaling-fleet caught in the year 1684, no less than 1185.

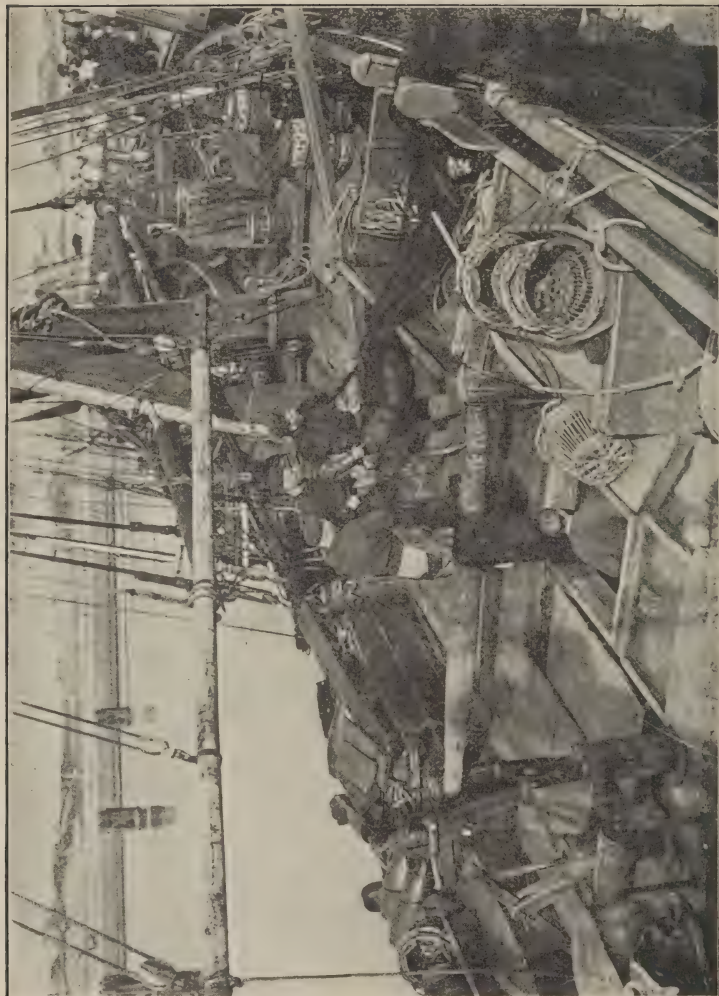
After the dissolution of the Compagnie whale-fishing was continued by private enterprise with intermittent success, off Greenland and about Davis Strait. The 14,167 vessels which put to sea after the Compagnie had ceased to exist, yielded a total of $44\frac{1}{2}$ million guilders. Towards the end of the 18th century, however, the industry began to decline, and in 1864 the last whaler, the Dirkje Adama, was sold at Harlingen. In 1869 another attempt was made by Mr. C. J. BOTTEMANNE to establish a Whaling Company, but the venture went into liquidation in 1872.

FISHERY LEGISLATION.

Whereas sea-fishing attained comparative prosperity in the 2nd half of last century, *fresh-water fishing*, in rivers, canals etc., slowly decreased, chiefly owing to the fact that



Lugger in full sea.



Loading nets for a herring-trip

unauthorised fishing in private waters, though prohibited, was punished only by the lightest of penalties, (not as a crime, but as a trespass). A more adequate regulation of the Fisheries was repeatedly pressed for, and the fishers themselves eagerly looked forward to fresh legislation.

The Act of June 21st, 1881, contained regulations regarding sea- and coastal-fishing, and also regarding fishing in the Zuyder Zee and the Zeeland streams, fresh-water fishing being regulated in the Act of 1857, along with the chase. This state of things was brought to an end by means of the new Fisheries Act, which after endless difficulties and lengthy preparations was enacted on October 6th, 1908, and came into force on July 1st, 1911. For the first time, all the fisheries were comprised in the one bill, being classified as:

I. Sea-fisheries.

II. Coastal-fisheries.

III. Inland-fisheries.

This Act institutes a *Fisheries Board*, in which has been merged the former Sea-Fisheries Board. This Board gives advice independently, or acts as advisory body in cases where the Government consults it regarding the true principles of conduct for Government intervention in this branch of national prosperity.

The work of the former Adviser in fishery matters, and of the former State institution for investigation at sea, has been entrusted by Decree of May 10th 1912 to a State Institute for Fishery Investigation, which furnishes scientific information on all matters concerning the fisheries.

Following the example of other countries, a new sphere of activity has been created by the introduction of a system of *Inspection*. Officials are appointed to supervise the fisheries, to enforce the carrying out of the enactments, to serve as technical helpers and advisers to those employed in the fishing-trade, and to investigate how and by what means the fisheries can be promoted. This work covers a wide range, and in the first years of its establishment the service grew to a great number of officials.



A Maassluis lugger.

I SEA-FISHERIES.

From an economic point of view this branch of the fisheries is by far the most important. It is carried on in three different ways :

1. Drift-net fishing for herrings.
2. Long-line fishing.
3. Trawl-net or trawl-fishing.

Drift-net fishing. The herring fishery is carried out by means of drift-nets, 100 or 150 of which are fastened together, often to a length of 3 to 4 K. M. (This is called the "Vleet"). Towards the middle of last century a great improvement was introduced by the shipowner A. E. MAAS of Scheveningen, who substituted light *cotton nets* for the heavier hemp nets, and who copied the French type of lugger, which was found to be far more serviceable for the fishing-trade than the old smack.

Even to this day the herring fishery remains the most important branch of the sea-fisheries. In 1913 it formed 74.52 % of the total catch of salt-water fish for that year, the profit representing 69.59 % of the total yield.

As the type of herring-vessel got larger, the old sea-side towns, where in winter the smacks were laid up on the beach, as for example Zandvoort, Scheveningen, Noordwyk, Hellevoetsluys and Katwyk, no longer came up to the requirements. Special harbour accomodation was needed; in 1899 Scheveningen got a fishing-port, which was completed in 1905. The plans for the extension of the inner harbour at Katwyk are awaiting execution. The need of centralization for the sale and despatch of fish was likewise felt, so that those harbours that were easily accessible, and had sufficient depth, soon attained greater importance, as the vessels from other ports could come in and land the fish there. The major part of the herring-fleet is concentrated in 5 ports, to wit: Katwyk, Maassluys, Scheveningen, Vlaardingen and Ymuyden; and in 1913 the number of their craft amounted to 72 % of the whole fleet, representing 89 % of the total tonnage.



Harbour at Maassluis.

SUPPLY OF DRIFT-NET FISH.

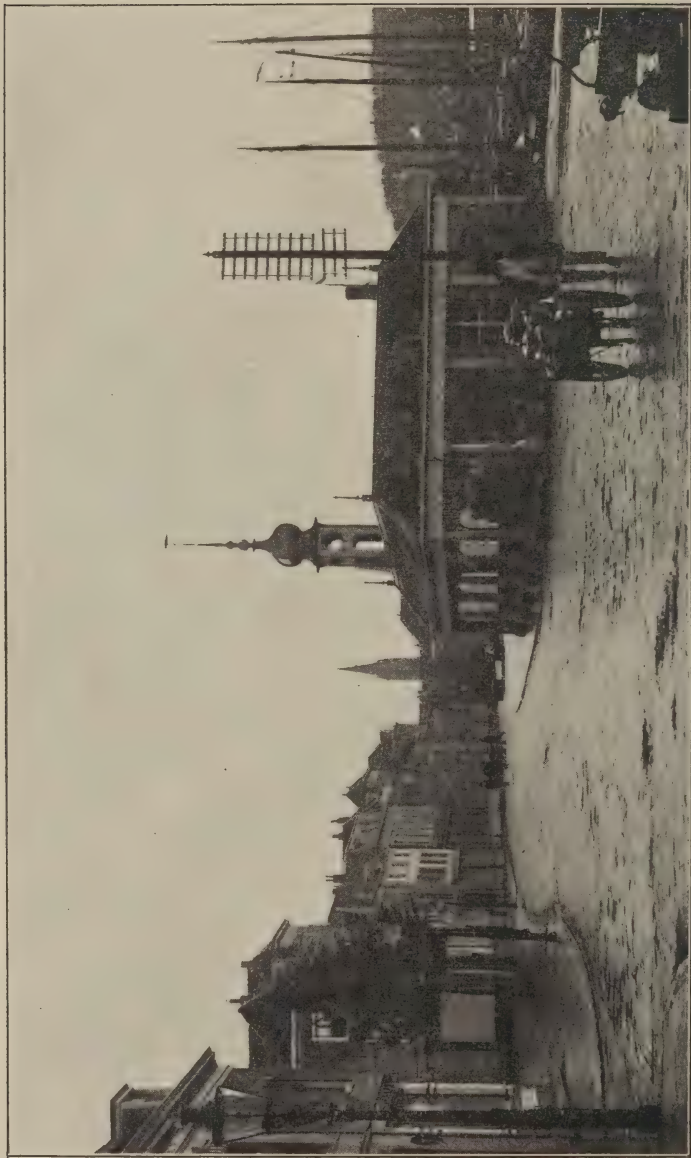
	1912.		1913.	
	Amount K.G.	Profit fl.	Amount K.G.	Profit fl.
Ymuyden.....	2.249.640	347.863	3.683.425	519.519
Katwyk.....	11.659.000	1.816.262	17.926.800	2.617.619
Scheveningen..	23.607.700	3.843.892	36.626.800	5.542.705
Maassluys.....	9.272.400	1.498.640	13.028.100	2.000.434
Vlaardingen...	18.444.600	3.071.678	28.142.200	4.389.358
Total (including minor fishing centres).....	66.213.640	10.732.540	100.549.025	15.242.448

Besides the supply of herrings, landed by the Netherlands vessels, there is a considerable quantity of herring and mackerel (which is always caught along with herrings), brought into our harbours by English boats. In 1913 this amounted to 7,107,198 K.G., with a profit of fl. 576,641, as against 2,960,835 K.G. (fl. 235,444) in 1912, and 740,775 K.G. (fl. 75,032) in 1911.

In 1914, on account of the war, only one English drifter came to the Ymuyden market, so that the supply of fresh herring and mackerel from foreign vessels in 1914 was only very small.

The smaller fishing-boats are gradually disappearing; in 1913 there were only 119, and in 1914 only 64 boats of the old type left. Luggers took their place, — as it was difficult to engage crews for them — the men preferring to serve on the larger boats, which moreover allow the fishing-trade to be carried on more economically. In 1913 the herring-fleet totalled 751 boats, the cubic contents being 182,184 M³; in 1912 it was 741 boats, with 174,028 M³. contents, whereas in 1892 the number had been 546, with 83,451 M³. contents.

It is curious to observe how little mechanical means of propulsion have so far been applied to herring-fishing, far less than in trawl-fishing, and that the former trade is carried out mostly by means of sailing-boats, which in the trawl-fishing trade have already been replaced by steamboats.



Fishmarket. at Vlaardingen.

In Vlaardingen, however, steamboats are beginning to be used, since the construction in 1896 of the first steamer for Mr. A. HOOGENDIJK JZN., and the practice is growing as these boats have proved to be adaptable for long-line fishing in winter, as well as for herring-fishing in summer.

Long-line Fishing. This is carried out by means of long lines, anchored to the bottom of the sea, and branching off into shorter sidelines furnished with hooks, to which the bait is fastened. These so-called "lines" are often as long as 12 K.M.

Long-line fishing is a trade which is decreasing every year, and which is now being carried on mainly as a side industry in spring and autumn, along with drift-net fishing. Most long-line fishing-boats engaged in the main trade are registered in the three towns of Middelharnis, Maassluys and Pernis. From 50 vessels in 1892, the number fell to 12 in 1913, and to 6 in 1914!

SUPPLY OF LONG-LINE FISH.

1912.....	2,049,413 K.G.	fl. 604,626
1913.....	1,530,980 "	" 539,667
1914.....	890,602 "	" 317,332

With the line are caught mainly: Haddock, cod, halibut, ray, and ling.

Haddock and cod constitute 78% of the total supply, and represent 88% of the total profit.

Trawl or trawl-net fishing. This is carried on by means of trawl-nets which are dragged along the bottom of the sea. The development of this trade is closely connected with the immense rise of *Ymuyden as a fishing-port*. In the course of a few years it has become the largest in the European continent. Only England has larger fishing-ports, like Grimsby, Aberdeen and Hull. Its situation at the mouth of the North Sea Canal, and in close proximity to Amster-



Scheveningen fishing boats on the shore before the fishery-harbour had been constructed.

dam, enables Ymuyden to despatch the fish by water as well as by the main railway-lines. It has Germany as hinterland, and daily despatches enormous quantities to the Rhine province and Belgium.

Ymuyden owes its existence and its rise to the construction of the North Sea Canal, which directly connects Amsterdam and the Zuyder Zee with the North Sea. In 1865 the work of construction was begun, and on Nov. 1st 1876 the Canal was inaugurated. Ymuyden at that time was far to seek, and now it numbers more than 10,000 inhabitants!

With truly American rapidity it is growing into a town of importance, leaving the town of Velsen, under administration of which it falls, far behind in development. Originally the fishing-boats entered Ymuyden as a refuge, and lay sheltered in the canal. When however the locks were extended, and the increasing fishing traffic blocked the entrance to the harbour, there was no longer room for the fishing-boats, so in 1887 the Government decided to make a special harbour for fishing-boats, which was inaugurated in 1896. The depth of the canal and harbours renders it possible for steamboats to carry on the fishing trade; as early as 1901 the harbour had to be enlarged, and it now covers an area of 13 HA.! The anchorage, which is now being constructed, will cover an area of 3,5 H.A. The catch is taken to three fish-markets, situated next to the railway, the markets even being provided with a special despatch-station of their own. The auction is conducted by the Government. Thus the State remains liable for the purchasers, but the liability, in virtue of a contract between the State and some Banking firm, is taken over by the latter body. At the other ports the fish-auction is not a Government institution. There the auctions, though public in name, are conducted by the ship-owners' societies or by the municipalities themselves.

The rapid development of Ymuyden may be judged from the number of ships entering the harbour:

1897: 9,794 vessels with 690,507 M³. total contents, *average content 70.5 M³*. Of these 68 were steam-trawlers, and 8,872 trawl-fishing sailing-boats. (6981 coastal-fishers.)

1914: 13,598 vessels with 3,358,125 M³. total contents,



Fishery-harbour at Scheveningen.

average content 246,50 M³. Of these 4514 were steam-trawlers and 6314 trawl-fishing sailing-boats (4666 coastal-fishers).

255 of them were long-line fishers and 349 drift-net fishers, whilst 2,166 were cargo-boats for the transport of fish. The number of foreign vessels, mostly English, is considerable: in 1913 it amounted to 338 steamboats (333 of which were English) and 46 English sailing vessels.

Next, a few items concerning the total supply of fish at the Government market:

1900.....	fl.	818,970
1905.....	„	4,072,666
1911.....	„	5,379,029
1912.....	„	6,974,394
1913.....	„	6,995,785
1914.....	„	7,134,466
1 st 9 months of 1915..	„	10,388,148

The increase from 1912 to 1913 is comparatively low on account of the fishermen's strike in November and December 1913.

The greater part of this fish is for export. In 1913 the water-carriage amounted to 7,064,285 K.G., in 1914 to 7,009,040 K.G. The export by rail from Ymuyden in 1913 was: 34,391,926 K.G., in 1914 35,503,241 K.G., and the proportional percentage for the 5 countries of destination was:

	The Netherlands.	Germany.	Belgium.	France.	Switzerland.
1912	31.8	39.4	27.5	0.8	0.5 %
1913	29.4	38.2	30.9	0.9	0.6 %
1914	35.3	47.7	14.7	1.0	1.3 %

Though fish is exported to England also, no figures can be given, the purchases being sent to inland forwarding-agents; the amount is therefore comprised in the figure for Holland, quoted above.

A few figures concerning the sea-fisheries in general may be given here:



Harbour at the Isle of Urk.

EXTENT OF THE FLEET.

TRAWL-FISHING			DRIFT-NET FISHING		LONG-LINE FISHING.	
	Number of craft.	Gross content in M ³ .	Number of craft.	Gross content in M ³ .	Number of craft.	Gross content in M ³ .
1911	512	84,969	751	172,477	22	6200
1912	546	102,086	741	174,028	20	5720
1913	560	112,183	751	182,184	12	3513
1914	547	110,632	774	193,208	6	1756

TOTAL PROFIT.

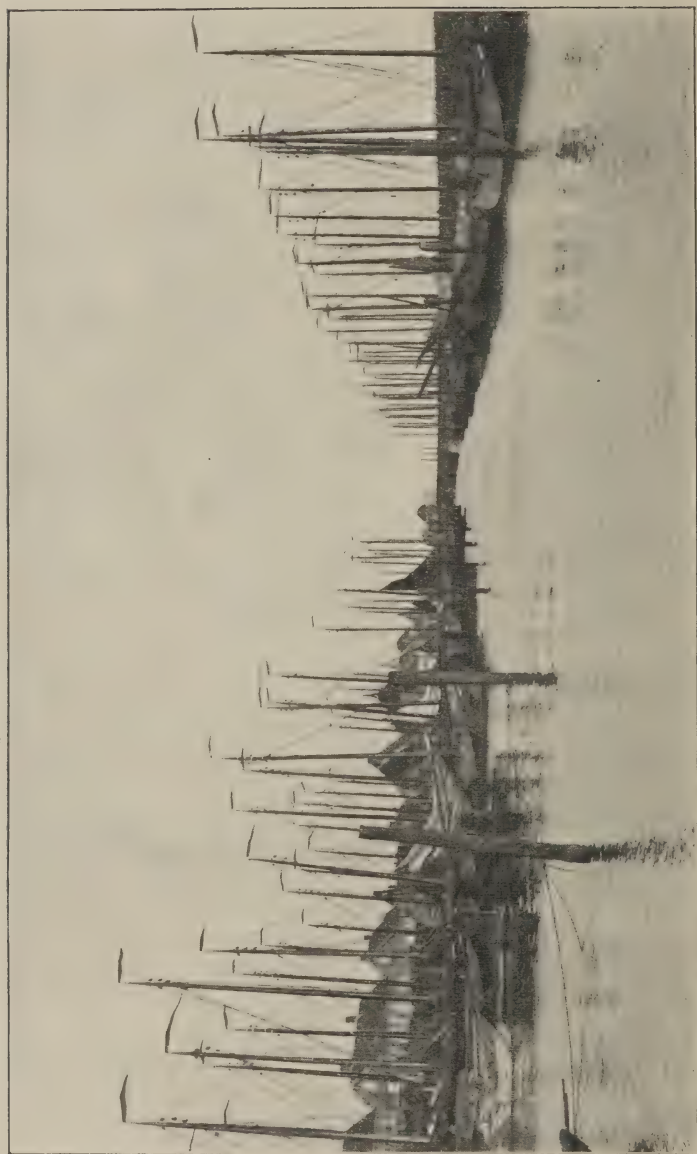
	TRAWL-FISHING.		DRIFT-NET FISHING.		LONG-LINE FISHING.	
	Amount in KG.	Profit in fl.	Amount in KG.	Profit in fl.	Amount in KG.	Profit in fl.
1911	29,445,537	4,803,705	85,639,125	11,035,636	2,369,525	703,838
1912	35,292,380	6,399,633	66,213,640	10,732,540	2,049,413	604,626
1913	31,507,980	5,977,284	100,549,025	15,242,448	1,530,980	539,667
1914	36,030,849	6,807,938	66,145,820	12,599,009	890,602	317,332

TOTAL IN FL.

1911.....	fl. 16,543,179	1913.....	fl. 21,759,399
1912.....	„ 17,736,819	1914.....	„ 19,724,329

YIELD OF THE MAIN KINDS OF FISH FOR 1913.

FISH.	Trawl-fishing.	Long-line fishing.	Drift-net fishing	Total.	Amount %	Profit %
	in fl.			in fl.		
Turbot.	565,511	—	—	565,511	0.51	2.60
Sole.	1,011,640	—	—	1,011,640	0.43	4.65
Plaice.	1,224,146	—	—	1,224,146	7.46	5.63
Ray.	161,526	18,143	—	179,669	0.91	0.83
Haddock. . .	1,264,303	328,011	—	1,593,314	5.02	7.32
Cod.	918,773	147,052	—	1,065,825	4.90	4.90
Whiting. . .	161,254	647	—	161,901	1.63	0.74
Herring.	8,158	—	15,134,773	15,142,931	74.52	69.59
Mackerel. . .	32,553	—	107,675	140,010	0.94	0.64
Flounder. . .	120,418	—	—	120,410	1.33	0.65



Harbour of Bruinisse (Zeeland).

TOTAL INCLUDING OTHER KINDS OF FISH.

fl. 5,977,284	fl. 539,667	fl. 15,242,448
with	with	with
31,507,980 KG.	1,530,980 KG.	100,549,025 KG.

EXPORT.

In 1913 to:	KG.
Belgium.....	21,280,138
Germany.....	90,459,601
England.....	1,119,302
France.....	145,295
Norway.....	1,102,571
Sweden.....	3,793,603
British North America.....	218,069
United States of America.....	16,950,667
South America.....	831,034
Other countries.....	2,283,619

Three quarters of the export was herring, the rest cod or other fish. Only a small quantity of certain kinds of fish is consumed in The Netherlands, where so far fish cannot be called a "national dish". The war, however, has caused a rise in the price of meat, and so the "*Central Bureau for the sale of fish*", called into being by the abnormal state of affairs, is trying to meet the exigency by introducing fish as a cheap food for the people. In 1915 the municipalities of numerous towns established markets or shops for the sale of fish.

TRAINING FOR THE FISHING-TRADE.

In 1913 and 1914 the number of men employed in the sea-fishing trade amounted to about 12,000, including some 1000 hands serving on vessels engaged in coastal-fishing as well as sea-fishing.

Fishery-Schools exist in twelve towns: Enkhuyzen, Harderwyk, Hindeloopen, Katwyk-on-Sea, Maassluys, Marken, Noordwyk-on-Sea, Scheveningen, Spakenburg, Vlaardingen, Volendam and Ymuyden. A fishery-course is moreover conducted by the School of Navigation at Helder. Most of these schools are municipal institutions, others have been



Harbour of Ymuyden with fish-auction-buildings.

established by different Societies, *all* are endowed by the State and the Province. On the whole however, the instruction leaves much to be desired as yet, and is not conducted on the same basis and lines of development as in England. At the Fishery-Schools the men are principally taught to navigate their vessels, they learn the rudiments of navigation, and the repair of fishing-tackle, whereas it would be advisable rather to instruct them in the handling of the fishing-tackle, in the life and habits of the fishes, and the way to deal with them afloat and ashore, in the most rati-



Fishery-school with a number of pupils at Maassluys

onal method of exploiting the fishing-waters, in the economics of the fishing-trade, and in fishery-legislation. Not long ago a bill was introduced into the States-General, regulating the professional instruction, and dealing also with the Fishing-trade.

The appointment of an itinerant Fishery Instructor is being likewise discussed, and in the State budget for 1915 a sum has already been set aside for his remuneration. By giving practical instruction in Fishery at the principal Fishery-Schools, this official is, for the time being, to amend the defects of the present system of training.



Fishing with the so-called "ankerkuil" (Zuiderzee).

HOSPITAL AND CHURCH BOAT.

As a result of private initiative, and with an annual State endowment of about fl. 10,000, the Hospital and Church Boat "de Hoop" was fitted out, and since 1899 has been rendering service to fishermen of all nationalities. From June until the herring-fishing is over, this vessel cruises in the North Sea, in order to provide the crews of the fishing-fleet with medical and religious assistance.

II. COASTAL-FISHING.

As distinct from sea-fishing, coastal-fishing is mainly a "retail trade", except in regard to oyster culture and part of the mussel-fishing.

The Act of 1908 regulated it apart from sea-fishing. For sea-fishing as well as for coastal-fishing the boats have to be registered and need a consent. (In 1913 there were 4,752 vessels registered and 8,849 consents were granted).

The regions for coastal-fishing comprise the Dollard, the Wadden, Lauwerzee, Zuyder Zee, the Zeeland and South-Holland streams, and the territorial waters, so that in some places sea-fishing is practised along with coast-fishing. With the exception of the territorial waters, which on the whole are of a purely North Sea nature, all the said regions show more or less similar or equivalent biological properties, and the fisheries are of the same nature.

The coastal-fishing comprises the fishing of :

- a.* mollusca, (oysters, mussels).
- b.* crustacea (lobsters, shrimps).
- c.* divers kinds of fishes.

Though of less importance than sea-fishing, coastal-fishing yet plays a considerable part in the fishing-trade, providing a direct means of livelihood for more than 10,000 persons.

In the years 1892—1897 coastal-fishing yielded an average of fl. 940,000, and from 1898 to 1903 of fl. 1,900,000 a year. And ever since the profits have been increasing; in 1912 they amounted to fl. 3,984,783, in 1913 to fl. 5,160,096.



The major portion of the profit is yielded by the mollusca, in 1913 as much as 46.72 % of the sum total; next come



View in the harbour of Hoorn.

the divers fishes grouped together, 42.32 %, then the crustacea with only 10.96 % of the sum total.



Volendam fishermen fishing with the so-called "kwakkuil".



Volendam fishermen fishing with the so-called "wonderkuil."

a. *Fishing for Mollusca, mainly Oysters and Mussels.*

Artificial oyster culture, which flourishes especially in Zeeland (Ierseke), dates from the end of last century. The young oysters are caught on tiles lying in the water, or in shells, and are taken to deeper water, outside the dyke. There they remain until they are full-grown; they are caught again by means of trailing-nets, and kept in the so-called "putten" (pits).

Besides in Zeeland, we find oyster culture in the North, near Harlingen, in the Lauwerzee, in Texel and in Wieringen.

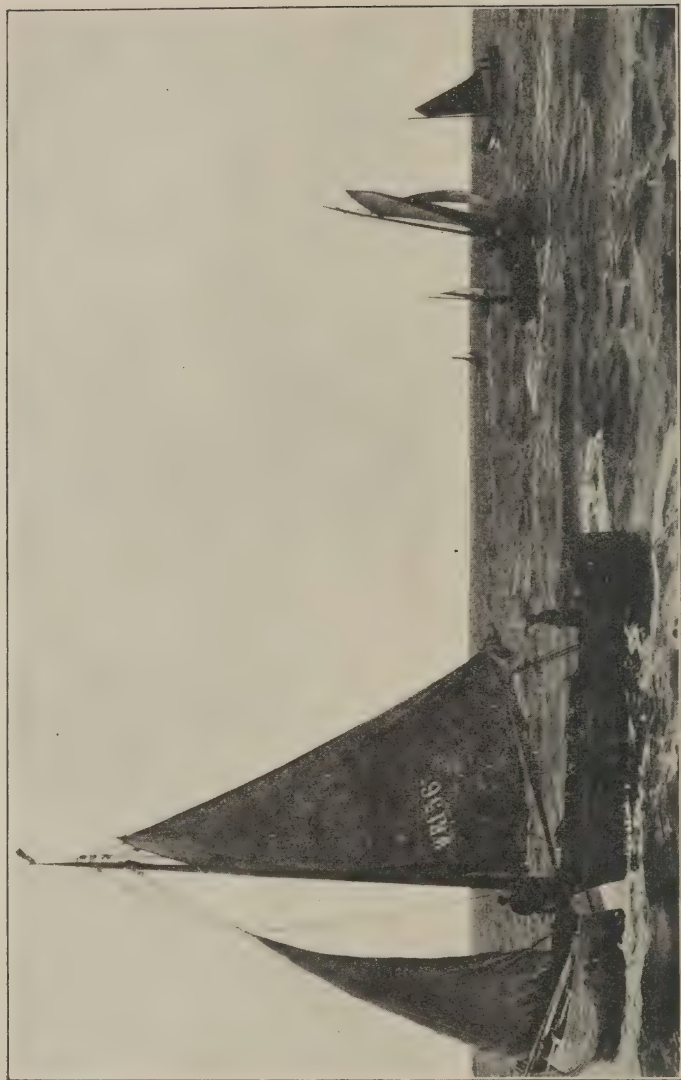
1913.

	number.	profit.
North Holland	2,766,600	fl. 99,637
Zeeland	46,851,005	„ 1,459,621
total	49,617,505	fl. 1,559,258
total 1912	45,909,159	„ 1,428,696
total 1911	50,857,000	„ 1,374,100

The following table proves that most of the oysters are exported to Belgium, but that France, England and Germany may also be reckoned as regular purchasers.

Export of oysters from Zeeland to :

COUNTRIES.	Season 1912/13.	Season 1913/14.	Season 1914/15.
The Netherlands	2,973,000	2,201,000	2,312,000
Belgium	21,182,000	20,663,000	11,297,000
Germany	10,892,000	11,357,000	6,817,000
England	6,037,000	8,337,000	2,224,000
France	5,523,000	7,107,000	6,000
Russia	208,000	156,000	—
Norway & Sweden	154,000	207,000	71,000
Total	49,969,000	50,028,000	22,727,000



Fishing mussels in the Zuydersea.

Mussel-fishing is pursued on the banks in the north of the Zuyder Zee, and in Zeeland. In the latter province it is of most importance. England is the principal purchaser, whither the export is mainly carried on from Harlingen and Helder.

	Amount in KG.	Yield in fl.
1911	44,294,708	fl. 715,654
1912	41,058,109	„ 666,091
1913	44,231,211	„ 715,887

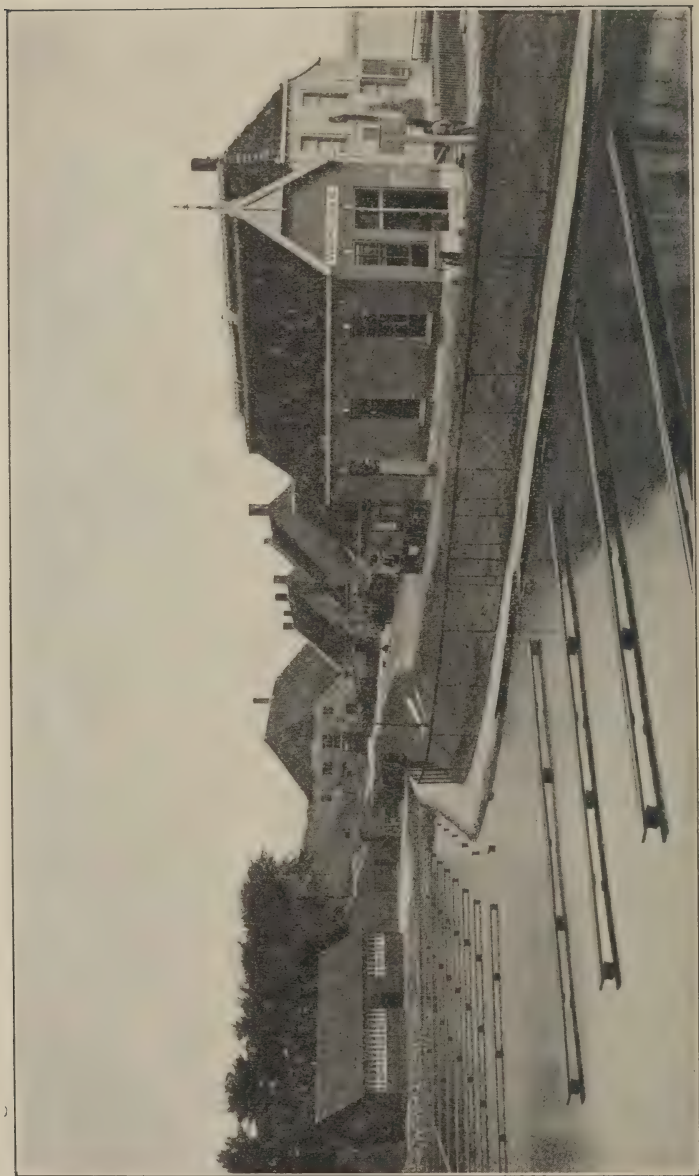
Of late the importance of mussel-fishing has grown, owing to the fact that mussels are used as a surrogate for “nest”, the food for ducks. This important factor for the Zuyder Zee fisheries will be treated separately further on.

b. *Fishing for Crustacea or Shell-fish*, meaning here *Shrimps, Lobsters* and *Crabs*. Of these shrimps are the most important. The fishermen of the North and South Holland sea-side towns fish in territorial waters, either in open boats, with a small shrimp-net, or on foot with a bay-shaped push-net. At the mouths of the South-Holland and Zeeland streams larger vessels are used, whilst in the Zuyder Zee the fishing is done with the beam- and the otter-trawl. Also off Helder and in the Lauwerzee there is a good deal of shrimp-fishing.

	Amount in KG.	Yield in fl.
1911	5,503,321	fl. 389,054
1912	5,543,080	„ 456,130
1913	5,709,825	„ 541,987

Shrimps are exported in important quantities. In the years 1897/1901 the export amounted to 2,581,277 K.G., in 1902/1906 to 2,296,440 K.G. and in 1907/1911 to 2,085,480 K.G. In 1913 alone 1,846,258 K.G. went to England, 670,980 K.G. to Belgium and 2,213 K.G. to France.

Lobster and Crab-Fishing. This is only done in Zeeland, on the Scheldt. Lobster-fishing has greatly increased of late years, on account of the larger catches in the western part of the Oosterscheldt.



Oyster pit at Tholen.

	Number of lobsters caught.	Yield.
In 1911.....	7,774	fl. 10,997
1912.....	13,528	" 16,932
1913.....	20,778	" 19,674

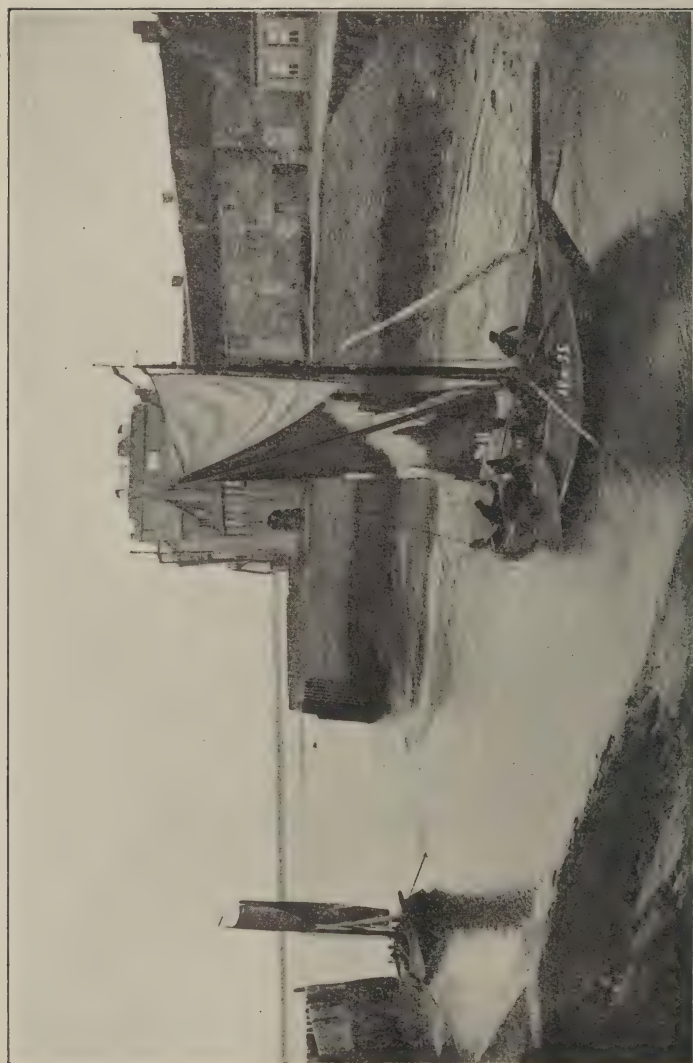
Crab-fishing is of less importance; in 1913 it yielded fl. 3,676. In connection with the manufacture of fish-meal, however, it is increasing in the Zuyder Zee and Waddenzee.

c. *Divers Kinds of Fish.* Of the various kinds of fish caught along the coast, only the following are of real importance:



Smeltfishery near Harderwyk.

a. *herring*; b. *smelt*; c. *flounder*; d. *eel*; and e. *anchovy*. These varieties yield more than 90 % of the profit.



Fishingboats of Arnemuyden in the harbour of Veere.

	1913. K.G.	Amount %	In fl.	Profit %
Herring	5,337,810	39.60	477,182	21.85
Anchovy	2,328,668	17.28	830,496	38.03
Flounder	1,151,729	8.55	318,178	14.57
Eel	679,219	5.04	319,437	14.63
Smelt	1,658,370	12.30	116,745	5.35

Before of giving a more detailed account of anchovy-fishing and the curious place it holds in commerce and in the fishing-trade, it is advisable for the sake of completeness to give in brief a general survey of the Zuyder Zee fisheries.

The Zuyder Zee fisheries constitute by far the most important part of the coastal-fishing. The fishing-villages with their quaintly dressed population possess a charm for every visitor. The vivid impression which Marken and Volendam make on all foreign tourists in Holland is indeed so striking, that imaginative foreigners often fancy that Amsterdam and all Holland goes about in wooden clogs and wide, baggy breeches. This same picturesque population however, is a tough race of fisherfolk of the true stamp. For them the draining of part of the Zuyder Zee would mean a great calamity, to which only generations to come will be able to adopt themselves. The draining projects are the order of the day just now, so that the characteristics of these fishing-villages may be doomed to vanish before very long.

By the proposed draining operations a Zuyder Zee province will be reclaimed; covering an area of 211,830 H.A., which will provide accomodation for some 200,000 or 250,000 people. The cost is estimated at fl. 163,000,000.

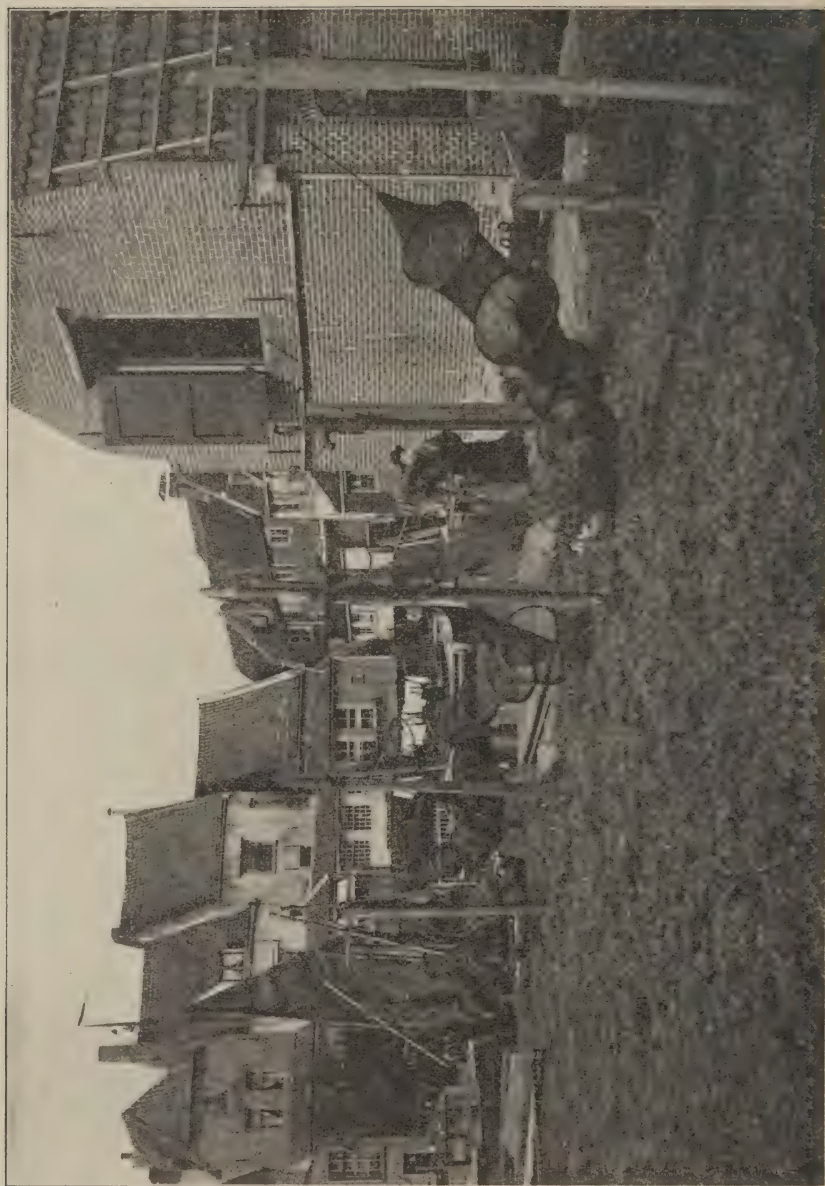
Fishing in the Zuyder Zee is carried out with:

a. stationary nets, e. g. anchovy-nets, flounder-nets etc.

b. drift nets.

c. trawl-nets. Here a distinction is made between:

α. the beam-trawl, which is dragged alongside of the boat as she moves sideways.



Drying bow-nets (eel-nets) at Enkhuyzen.

β. the otter-trawl, dragged behind the boat.

γ. the wonder-net, dragged between two boats at a high speed.

This last is used mainly for anchovy, herring, shrimps and smelt. It gave so much offence that it has been given the name of "moordkuil" (murder-net).



Smeltfishing near Harderwyk.

The speed with which it is drawn through the water, and its wide surface, enables it to carry along all that comes in its way. The quantity of tiny fishes thus caught, the so-called "nest", is used as food for ducks. The consequence of this process must needs be the destruction of the smaller but valuable breeds of fishes, and this leads many to the opinion that such fishing exhausts the sea. Volendam, however,

cannot do without it, and succeeded in obtaining the repeal of the original prohibition against its use.

The fishermen derive a considerable proportion of their profit from the "nest", which they sell to the duck-breeders in the South-Eastern part of North-Holland, (especially in Landsmeer), where according to a general estimate 170,000 ducks are fed on the "nest", of which on an average 11,640,000 K. G. are needed.

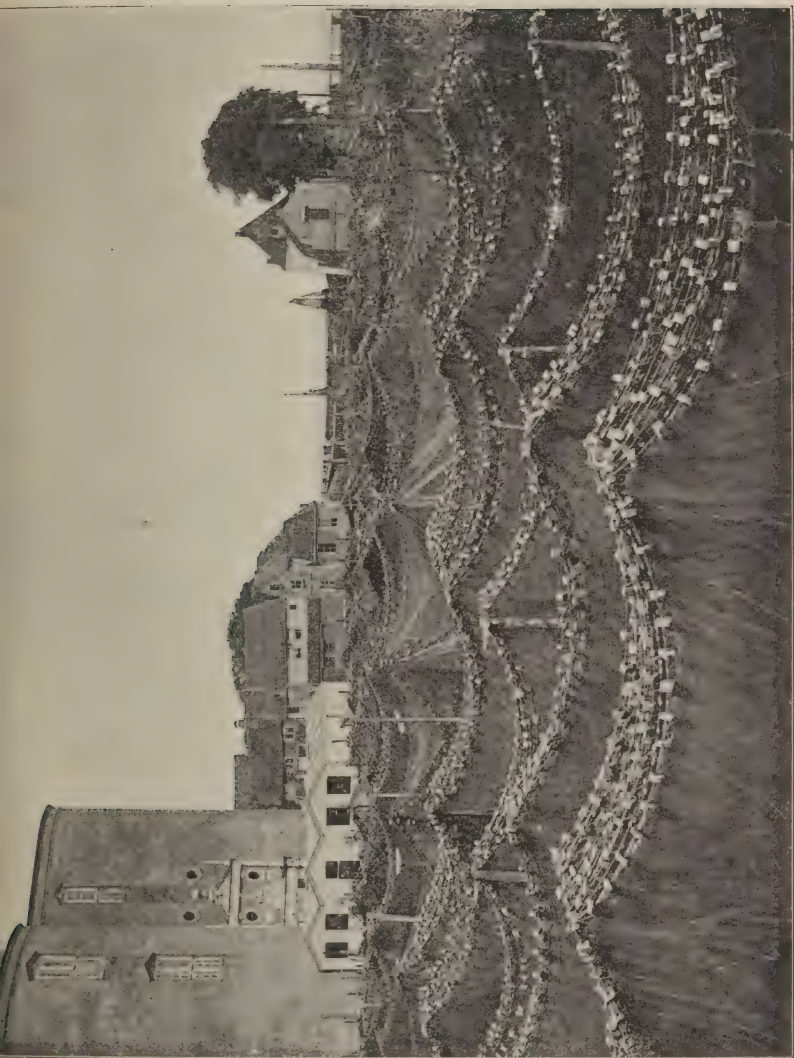
By the introduction of a close season, by prohibitions in certain areas, and by regulations as to the width of the meshes, an attempt was made to counteract this influence which might react detrimentally on the fish supply. In preference to an absolute prohibition of "nest"-fishing, which would have farreaching economic consequences, other methods are being tried; at the instigation of the Fisheries' Inspectors an attempt is being made, and with some success already, to encourage mussel-fishing; the mussels are ground, and in that state form a substitute for the "nest."

ANCHOVY-FISHING.

The anchovy is *the* Zuyder Zee fish. It is found chiefly in the Mediterranean and in the Atlantic, and towards the end of April or the beginning of May it comes in shoals from the North Sea into the Zuyder Zee. The fish are then 1 year old and are caught with the trawl, stationary, or drift-net.

Prosperity in the typical villages on the Zuyder Zee, as the statistics given prove, depends to a considerable extent upon the anchovy-fishing, and in no branch of the fishing trade are the results more uncertain years of exceptional prosperity like 1906, when the yield amounted to nearly one million guilders (fl. 944,500), alternate with years like 1908, which produced scarcely fl. 13,800. In 1909 the anchovy-fishing in the Zuyder Zee yielded fl. 746,400, in 1910 fl. 125,000, and in 1911 fl. 403,000.

Immediately on arrival, the anchovies are pickled, and packed in barrels, called "ankers" (anchors). In 1912, 68,000 "ankers" were pickled, to a value of fl. 980,000; in 1913, 50,000 "ankers", to a value of fl. 697,000; in 1914 the catch



Drying anchovy-nets at Enkhuizen.

was only one third of that of 1913, (14,900 "ankers") and in 1915 there is further decrease — no more than 3600 "ankers"! On the Amsterdam Exchange the anchovy is an important speculative commodity. Like the catch, the price is subject to great fluctuations, caused alike by the varying hauls and by the possibility of preserving anchovies for many years. Anchovies more than a year old are usually higher in price. The price per anker, varying in 1915 from fl. 35 to fl. 55 for the new, and from fl. 45 to fl. 67 for the old anchovy, in 1914 fell to from fl. 12½ to fl. 22½ for the new, and from fl. 19 to fl. 28 for the old. The figures will give some idea of the immense sums involved in the sale of the total stock.

The pickling is done by a great number of hands, mostly people of slender resources who are obliged to obtain an advance on their "ankers," which they store in the "*veem*", or bonded warehouse. Here the weight is ascertained by means of the "spoelen" (washing) process; the normal weight per "anker" is 30 K.G. In respect of the "ankers" deposited, the "*veem*" gives the pickler a receipt for a stated weight, no attempt being made to discriminate between the "ankers" of the different fishermen. The receipt can pass from hand to hand; it gives no special right to the "ankers" deposited by the pickler, it only entitles the holder to a certain weight of anchovies of a certain year. No distinction is made as to quality, the value of the anchovy depends only on the year of the catch.

By far the largest export is to Germany, but trade is also done with Belgium, England and America.

ANCHOVY CONTROL.

On account of repeated complaints from the parties concerned, about the abuses in the existing practices in the anchovy-trade, and at the initiative of the Fishery Inspectors, the Government was in 1912 induced to institute the Anchovy Control Society, a body of picklers and dealers, bound to adhere to certain Government regulations stipulating a minimum weight of fish per "anker", adequate

preparation, and certainty as to the place of origin of the anchovy. The "ankers" are to be provided with control-marks, so that at any time the identity of the anchovy and of the owner can be ascertained. In commercial quarters, however, there is sharp opposition to the Society and its system of control; it is feared that it will prove a serious hindrance to the market.

III. INLAND FISHING.

With inland fishing, as with coastal-fishing, the retail-trade predominates, except for salmon-fishing in the rivers, which is carried on by strongly financed organisations.

Inland-fishing is divided into :

a River-fishing in the larger streams.

b. Fishing in other waters, — lakes, canals, and pools, — inland-fishing proper.

a. RIVER-FISHING.

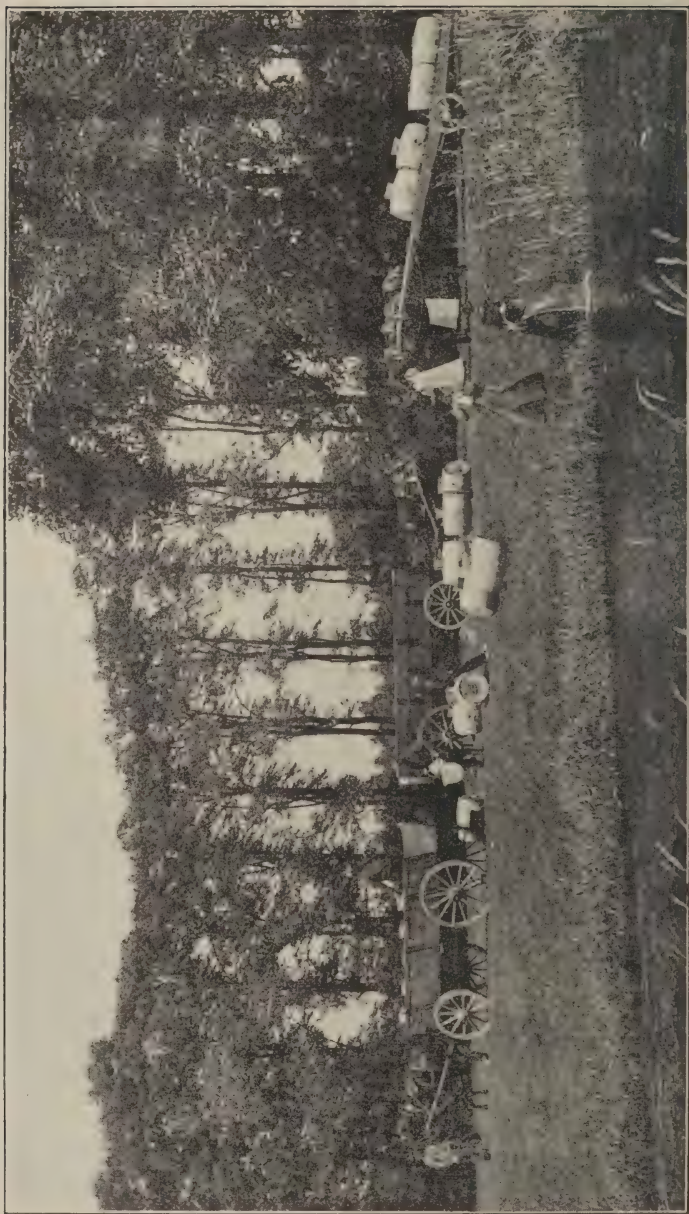
Apart from the ordinary kinds of fish that abound in all inland-waters, and among which the eel ranks first, river-fishing derives its importance from the so-called migratory fishes, which come from the sea to breed in the rivers.

Salmon.

The salmon, the most important of the migratory fishes, ascends the Maas, the Waal and the Rijn, to spawn far up these rivers in some affluent or rivulet with a stony bottom.

With a view to the great importance of the maintenance of the salmon stock a beginning was made in 1861 with the stocking of young salmon in the lower rivers. In that year 8000 six weeks' salmon were introduced into the river Lek. The stocking was regularly continued and in 1872 even largely extended, so that from 1872 to 1897 135 millions of six weeks' and 300.000 one year's salmon were introduced into the Netherlands waters.

Germany however suggested to The Netherlands that the too rigorous catching of sexually-ripe salmon ascending

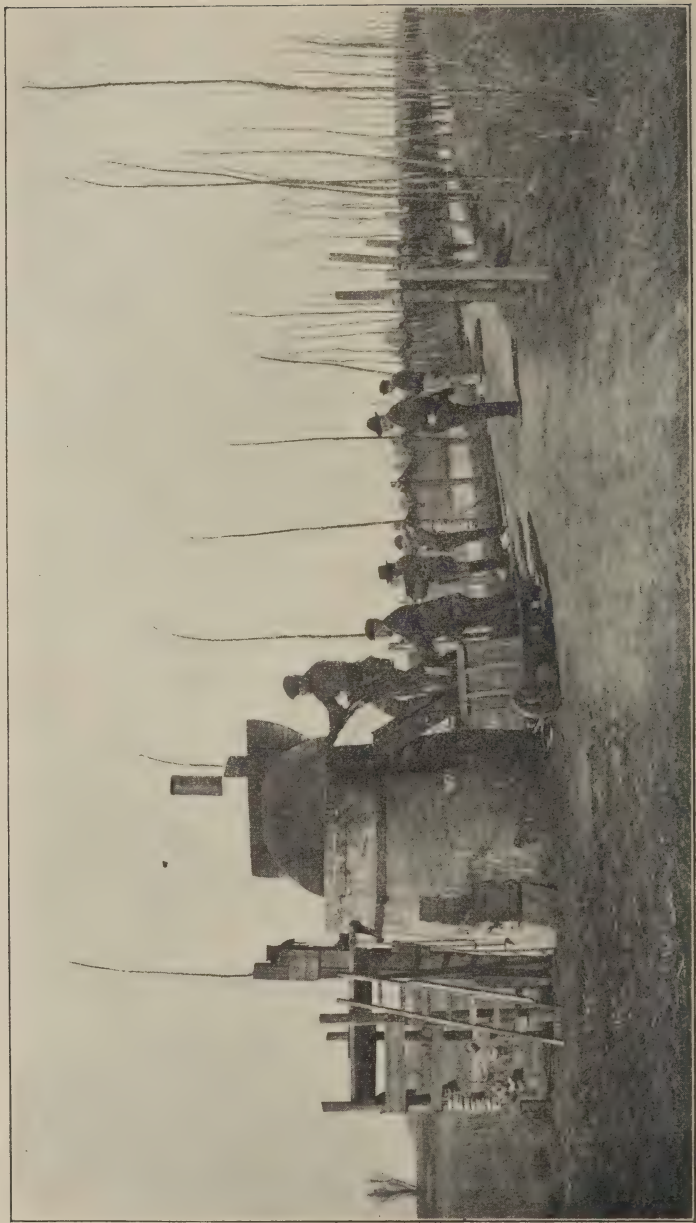


Introducing six weeks' salmon in the Yssel near Laag Keppel.

the rivers, might interfere with their natural propagation. Several German and Netherlands experts questioned the results of stocking in The Netherlands and advised to introduce the young salmon into the upper rivers. Thus, in order to protect the salmon-rearing, Germany and The Netherlands concluded the Salmon-contract of 1885, instituting a "close season" (from the middle of August to the middle of October), and prohibiting fishing on Sundays, so that on one day of the week the salmon might pass unmolested. For the further improvement of the salmon-fishing trade, a sum of f 12.000 has figured in the budgets for the last few years, the object of which is to introduce into the upper waters of the rivers an average of some 2½ million young salmon.

The salmon hardly seem to be affected by these "protective" measures, and the good and bad years alternate as arbitrarily as the weather.

In the years after 1872 a prosperous period set in for the salmon fishery which lasted till 1896 and was at its highest in 1885; after 1898 the salmon catch declined from year to year. It even diminished from 50.000 pieces in 1898 to 19.593 in 1910. Many people opposed the government measures and as to the advantage of stocking the upper rivers, the opinions of experts differed. In 1906 a Royal Commission was therefore appointed to examine the salmon question and to decide on the course to be adopted. Many are of opinion that stocking the rivers in Germany is absolutely inexpedient, and aver that it should be done exclusively in this country. Besides the stocking in Germany as prescribed by contract, the "Nederlandsche Heidemaatschappij" at the instigation of experts, likewise since 1906 stocked our brooks and rivers with young salmon. The "Heidemaatschappij" is granted a subsidy of fl. 13,000 towards these experiments in salmon-rearing, having pledged itself to see to it, that every year a minimum of 2 million salmon-eggs is reared. The decrease in salmon is, however, no doubt largely due to the regulation of the rivers, increased navigation, and the pollution of the waters, and in Germany to the damming of rivulets and brooks by means of weirs, for industrial purposes.



Tanning and mending of salmon-dragnets.

For the Salmon-fishery the State rents the rivers in sections, and makes an annual income thereby of nearly £25,000.

Since 1910 the number of salmon caught every year, has increased (except in 1914) but slightly.

1908.....	29,557	fish	fl. 778,658	yield.
1909.....	29,057	"	" 591,595	"
1910.....	24,447	"	" 508,312	"
1911.....	39,376	"	" 796,384	"
1912.....	34,580	"	" 757,788	"
1913.....	43,594	"	" 922,459	"
1914.....	28,298	"	" 537,270	"

Shad, which used to bring in considerable profit, has fallen off even more than salmon. In 1885 184,179 shad were caught, in 1913 1,274. In 1914 there was a slight increase, the number being 1,678, and in 1915, 7,250.

SURVEY COVERING THE LAST FEW YEARS.

1908.....	39,562	fish	fl. 69,629	yield.
1909.....	49,819	"	" 67,255	"
1910.....	35,210	"	" 60,561	"
1911.....	5,481	"	" 15,072	"
1912.....	1,257	"	" 2,217	"
1913.....	1,274	"	" 1,677	"
1914.....	1,678	"	" 3,170	"

Other migratory river-fishes of some importance are sturgeon, fint, sea-trout and smelt.

b. INLAND-FISHING.

The main kinds of fish for inland-fishing are: eel, pike, perch, tench, carp, bream, roach.

As the regulations of the old law, covering both inland-fishing and the chase, left much to be desired, this fishing, mainly restricted to the retail trade, fell off more and more. The right of ownership of fishing-waters was insufficiently protected, no size limit for fishes had been laid down, and the close seasons were only locally, and inadequately regu-



Handling of the salmon-dragnets.

lated. Every one fished when he liked, regardless of all rational exploitation of the fishing-waters.

The new Fishery Act, which aims at amending this state of affairs, is of great importance for inland-fishing. It brought protection to the fishes, and made regulations regarding the method of fishing. The Board of Inspection and Advice to Fishermen, also contributes greatly to the raising of the fishing-trade from its state of temporary decadence.

Until the new law came into force, the "Nederlandsche Heidemaatschappij", established originally for the reclamation of waste land, stood up for the interests of the fishing-trade and gained great credit by its attempts to organize inland-fishing.

It was under its guidance that the various branches, to a number of 88, were formed, united under one main section of the "Heidemaatschappij." The branches comprise 3900 members.

Through the medium of this Company, too, the "Cooperative Savings and Loan Bank for Inland Fisheries" was called into being, with the idea of inducing its members to save, and of providing loans, for the improvement of the fishing-trade.

The consumption of fresh-water fish in The Netherlands is inconsiderable, the greater part of the fish being destined for export, mostly to Germany, England, France and Belgium. In 1913 5,172,250 K.G. of fresh-water fish was exported: 1,287,365 K.G. to England (mostly eel), 1,899,517 K.G. to Germany, and over 2 million K.G. to Belgium and France. The figures for 1914 are as follows: Total export: 4,656,276 K.G., of which 1,872,633 K.G. went to Germany, 1,229,103 K.G. to France and Belgium, 1,549,318 K.G. to England. To Belgium and France were exported enormous quantities of whiting, and they are sold there under the name of "friture."

For centuries past the export of eels to England has been carried on in the so-called eel-boats, which go direct from Friesland to England with cargoes of live eels. A unique privilege has been granted to these Netherlands eel-boats, which have an anchorage almost in the heart of



Salmon-market at Kralingsche Veer.

the metropolis. By virtue of an old concession granted by Queen Elisabeth, they are exempt from all tolls and harbour-dues, and are allowed to anchor between Billingsgate, London's main fishmarket, and the Tower. The privilege expires as soon as there are less than three of these craft moored to the banks of the Thames.

Inland fishing is only allowed by licence, except angling. For the season 1913—1914 30.298 licences were issued, of which 14.000 were large licences for the fishing with all kinds of warranted fishing tackle and 16.000 small licences. No trade is so popular as fishing and apart from a rather important number of professional fishers, who mostly earn a poor livelihood, many people practise fishing, especially with the rod, as a kind of sport or for amusement. The angling sport is a preeminently Netherlands sport. Every boy who can hold an angle, every private gentleman, every workman or businessman takes pleasure in fishing in the inland waters and gains vital strength by this sport to which all classes of the population indulge.

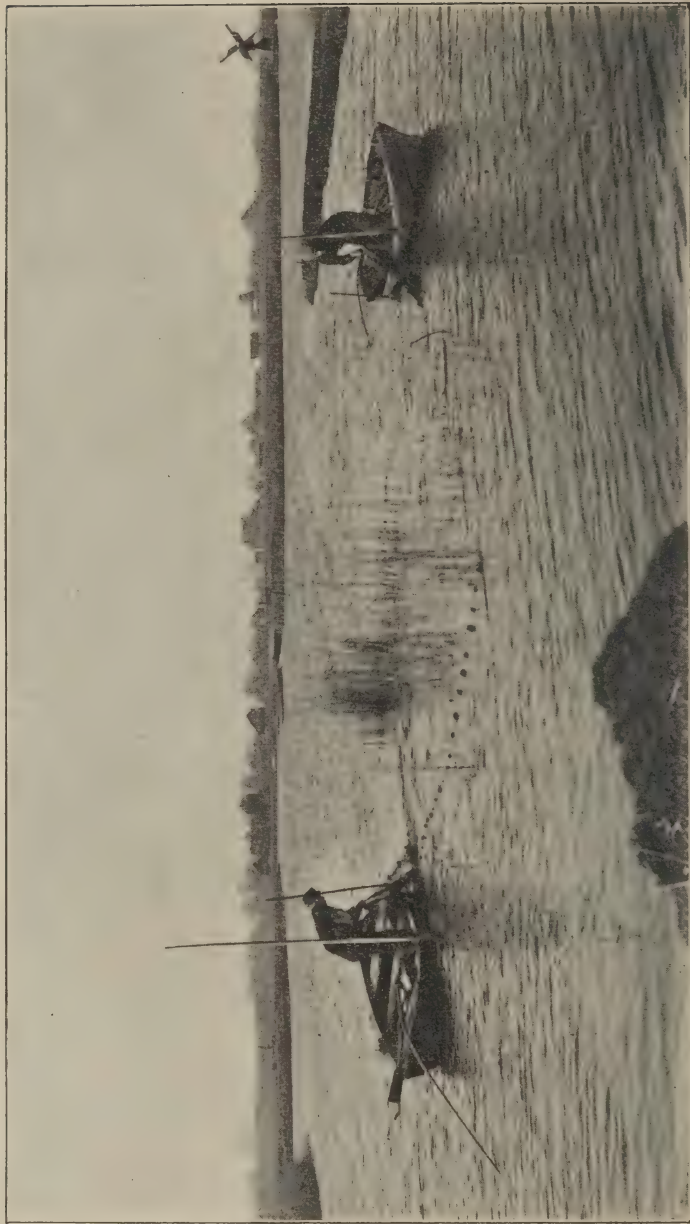
It is evident that especially under the old Act which did not sufficiently protect the fishing rights, conflicts could not be missing and that the rent-paying fisher did not love to see the amateur-fisher who caught the fish without bearing charges and who did not trouble about the exploitation of the fish-water.

* * *

In concluding our survey, it will be well to refer briefly to the by-trades, which, though not falling under the actual fisheries, are yet closely connected with them.

I. FISH-REARING AND POND-CONSTRUCTION.

Fish-rearing bears a close relation to the efforts that are being made to secure an abundant supply of fish in inland waters. The "Nederlandsche Heidemaatschappij", which receives an annual subsidy of fl. 4000 for the promotion of the fisheries, owns some land near Vaassen on the Veluwe, where great numbers of fish are reared, to be deposited, in



Fishing with a dragnet near Westzaan.

some cases free of charge, in public waters. These are mostly carp, tench and various kinds of gold-fish, while of late years perch and pike have been included.

Near Vaassen and in Arnhem the "Heidemaatschappij" possesses breeding-stations where salmon, trout and grayling are also reared. In order to counteract the decline of salmon-fishing the brooks of the Veluwe and Limburg are stocked with young salmon 6 weeks, 2, 3, 5, 6 or 9 months old, which, as a means of recognition, have been deprived of the adipose fin.

The trout-trade, carried on by the "Heidemaatschappij", at the "Zwaanspreng" near Apeldoorn, and by a few other institutions, shows a constant increase.

Pond-construction. By way of reclamation fish-ponds are constructed on certain level stretches of moorland, mainly for the rearing of carp, for export to Germany. The establishment of Messrs. VAN BEST BROS at Valkenswaard, and those at Heeze and Nederweert are the most widely known.

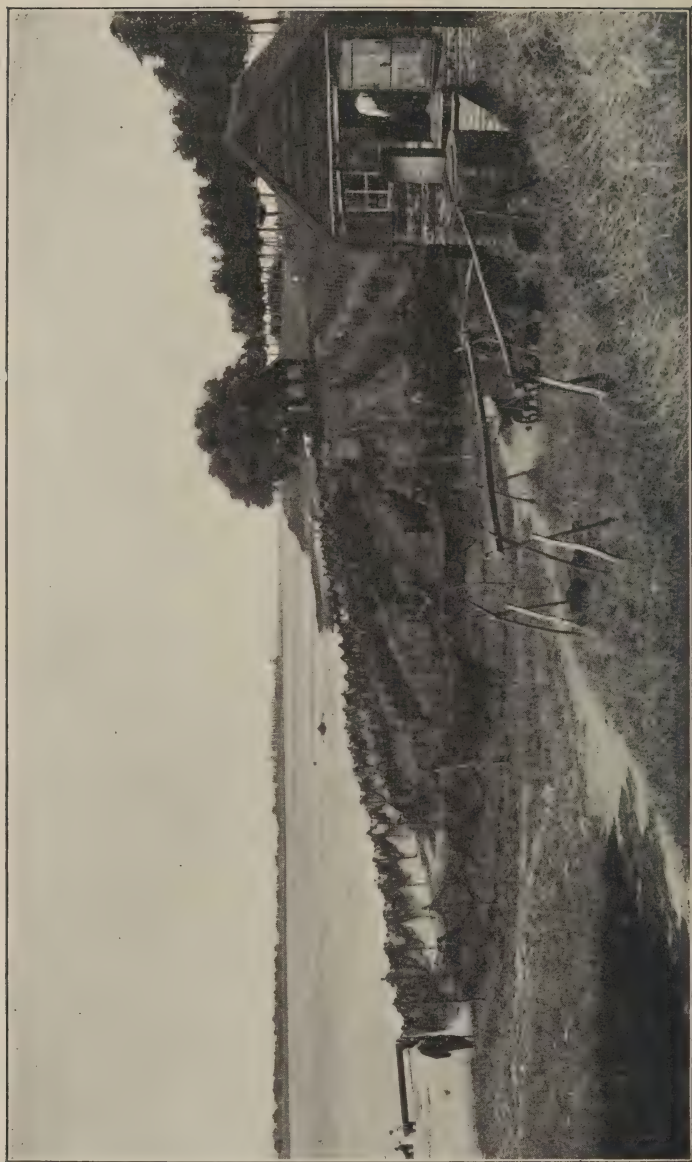
II. THE FISH-SMOKING TRADE.

This trade is carried on along the Zuyder Zee coast; some towns on the North Sea, e. g. Katwyk, Noordwyk, Vlaardingen and Scheveningen have smoking-sheds also. The most important of them, however, are to be found at Huyzen (for the export-trade), Spakenburg, de Lemmer, Kampen and Elburg.

Harderwyk, Monnikendam, Harlingen and Volendam possess minor establishments.

Bloaters, or smoked herrings, are the principal article of this trade. According to the method of smoking and the quality of the herring we distinguish between:

- a. *fresh bloaters*, for frying; (Zuyder Zee-herrings, lightly smoked and unsalted); they constitute one of the most common articles of consumption in The Netherlands.
- b. *hard bloaters*, salted North Sea bloaters, (the so-called sturgeon-herring), smoked for a considerable length of time over a smouldering fire so as to keep them hard.



Drying of nets near Gorinchem.

- c. *steamed bloaters*, salted and boiled over a hot fire.
- d. the so-called "*bacon-bloaters*", herrings from Norway, prepared and smoked like hard bloaters.

When the herring-season is over, these smoking-sheds are used for other kinds of fish also, e. g. mackerel and smelt.



Fishing with squarenet.

Eel. Smoked eel is a favorite dish, and of great importance alike for home-consumption and for export. The smoking is done all over the country.

Salmon and Shad-Smoking-sheds. Of course these are mostly found on the lower waters of the larger rivers, e. g. at Gorinchem and Kralingsche Veer. Besides the home-product, they smoke also American salmon, which is imported salted.

III. FACTORIES FOR FISH PRESERVES.

Mostly retail-trade, herring and eel.

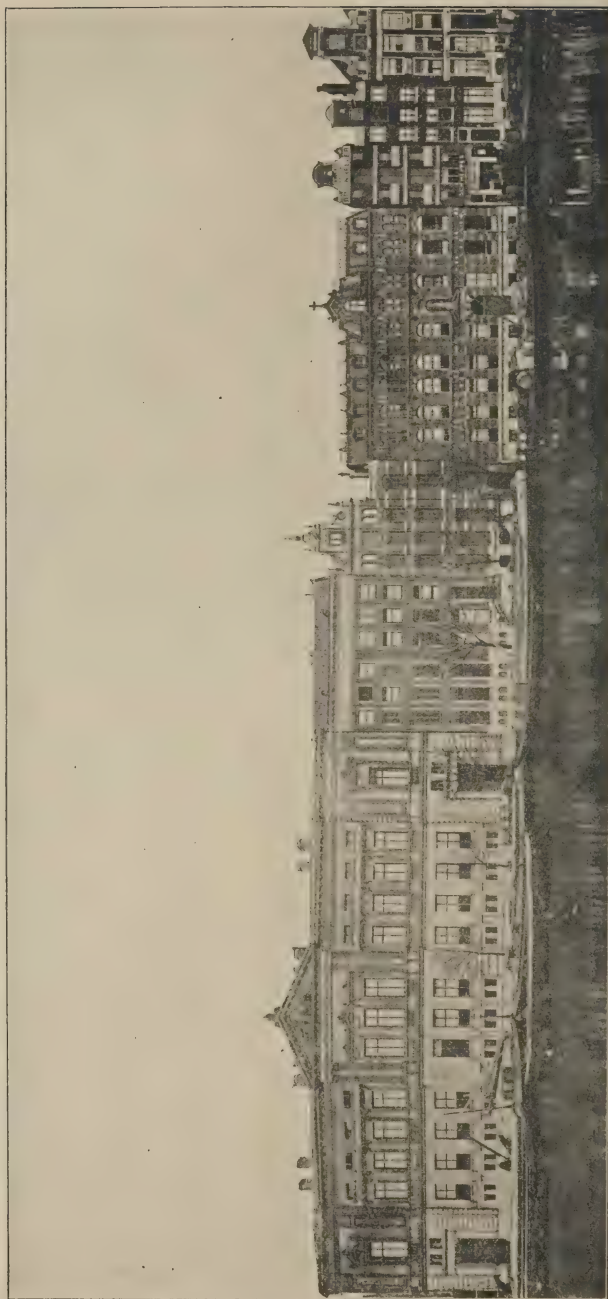
IV. SALT FISH.

Cod, ling, halibut etc., are salted as soon as they are caught, on board the boats.

In close, though not immediate relation to the Fishery-trade stand:

- a.* the shipbuilding-yards at Vlaardingen, Leyderdorp, Maassluys and Scheveningen.
 - b.* the net-factories and the cotton-yarn mills at Goor, Leyden, Apeldoorn, Sneek, Scheveningen and Gouda.
 - c.* the sail-yards at Maassluys, Vlaardingen, Scheveningen and Katwyk.
 - d.* the cooper-shops, especially in the herring-towns of Vlaardingen, Maassluys, Rotterdam and Scheveningen.
 - e.* the tan-yards and net-mending works.
 - f.* the ice-factories in the principal fishing-towns.
 - g.* the trade in salt and its import from Lisbon and the Mediterranean.
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CURRENCY AND BANKING: THE
MONEY MARKET AND THE STOCK
EXCHANGE BY PAUL SABEL, OF THE ROTTER-
DAMSCHÉ BANKVEREENIGING, AMSTERDAM.



Netherlands Bank, Amsterdam.

N 4719
no. 108

CURRENCY AND BANKING: THE MONEY MARKET AND THE STOCK EXCHANGE

BY PAUL SABEL, OF THE ROTTER-
DAMSCHÉ BANKVEREENIGING, AMSTERDAM.

FROM time immemorial the Netherlands have been one of the principal money markets of the world. This is owing to the country's favourable geographical position in central Europe, allowing it to act as an intermedium between the East and the West, the North and the South of Europe. This led to the development of a brisk shipping and trade, enabling the inhabitants to gather wealth. Then also the scrupulously guarded political and religious freedom caused the best powers of the old world to flock hither and to apply all their energy to the welfare of the prosperous republic, in recompense for the hospitality enjoyed. But why enlarge on the causes which made the Netherlands for a century the leading State in politics, and for another century gave it a preponderating position by reason of opulence, seeing these are described in the most exquisite manner by the American MOTLEY in his "Rise of the Dutch Republic"?

The war with Spain (1568 – 1648) compelled the inhabitants of this country to try and find their own way to the two Indies, and the cost being too great for a single person or firm, several merchants united and formed so-called "Companies for distant purposes", thus introducing the idea of co-operation, that afterward came to wide development. Though the expeditions of these "Companies for distant purposes" were generally successful, their mutual rivalry threatened to overthrow them all, for which reason it was resolved in 1602, under the influence of the great Netherlands statesman JOHAN VAN OLDENBARNEVELD, to establish the "East India Company", which during nearly two centuries exercised almost sovereign power in the Indian Archipelago, on the coasts of

India, in Ceylon and at the Cape of Good Hope, and had its factories even in Japan. The Company bore a pure monopolistic character and maintained the same as long as it existed.

Less fortunate was a kindred enterprise, the "West India Company", established in 1621, which at first made good profits, its principal object being privateering, by which means its vessels repeatedly seized Spanish homewardbound fleets laden with silver; but after the peace of Munster (1648) the Company drooped, the more so as it could not maintain its monopoly on the East coast of America and the West coast of Africa so positively as the East India Company could do in its sphere.

It was wound up in 1674. Under its monopoly fell also the trade to New Netherland, with the town of New Amsterdam (now New York), which part was discovered by an Englishman named HUDSON, in the service of Amsterdam shipowners. The island of Manhattan was bought from the Indians for 60 guilders, which sale constituted the first mercantile transaction, and assuredly not the least profitable one, between the Netherlands and the later United States. Long Island, Brooklyn, and Hempstead still remind one of the original Netherlands names of Lange-Eiland, Breukelen and Heemstede. The New Netherland Company, specially established for this region, only existed from 1614 to 1618, and this section was joined to its domain at the establishment of the West India Company. The cession of New Netherland to England in 1667 was one of the principal causes of the breaking up of the West India Company; Brazil was ceded to Portugal in 1681.

The founding of these Companies caused a lively trade in their shares on the Amsterdam Exchange, which had been opened in 1608. This Exchange, though not exactly the oldest of Europe, is at least the one where transactions, as practiced nowadays, had come to full development. Here we already find a speculative stock market in the beginning of the seventeenth century, and business in futures, with all the modern technical accessories, like clearing, &c., was developing. In the first decades of that century Exchange plots are recorded.

The establishment of the East India Company, under the auspices of Amsterdam, caused uneasiness to many and to no one more than to the French refugee BALTHAZAR DE MOUCHERON, who after the surrender of Antwerp (1585) continued from Middelburg his extensive trade with South and Central America and Russia. To give some idea of the importance of that trade we may mention that DE MOUCHERON counted his vessels by tens and let them sail under his private ensign (a Burgundian Cross on a green field). This gentleman entered upon negotiations with King HENRY IV of France (who wished very much to see the trade with India opened to his subjects), and with LE MAIRE, the father of the famous sailor. Now M. BUZENVAL, the French ambassador in The Hague, was financially largely interested in the Netherlands East India Company, and for this reason the establishment of the French Company, that threatened to become a competitor, was impeded to the utmost. Then LE MAIRE endeavoured to ruin the Netherlands Company by Exchange manoeuvres, but in vain. The only benefit resulting from this conflict was the discovery by the younger LE MAIRE of the way from Europe to the East Indies round South America.

The Directors of the East India Company also speculated in "actiën" (shares) of the Company and, by availing themselves of their earlier knowledge of internal circumstances, sometimes pocketed enormous profits. For this purpose they did not even shrink from publishing quite imaginary particulars and from paying visionary dividends to suit their speculations. An "Interstate Commerce Commission" or an "Interstate Trade Commission," if it had existed at that time, would have had plenty to do. But notwithstanding these base practises the Company made enormous profits. The dividends on the shares from 1605 to 1797 amounted to no less than 3,689 per cent. or 19,2 per cent. per annum, though there were 20 years without a dividend. On the other hand, there were also years in which 30, 40, and even 60 per cent. were declared. The highest price was paid for the shares in 1720, namely 1,080 per cent., but in 1780 it had receded to 327 per cent. In that year occurred the fourth English war,

which caused the downfall of the Republic and that of the powerful Company. A committee appointed by the "States General" reported in 1790 that the liabilities surpassed the assets by about 81 million guilders. In 1795 the "Heeren XVII" (Executive Committee) were discharged, and in 1798 the Company was dissolved and its debts consolidated with the General Debt of the realm.

Besides the shares of our overseas trading companies, the bonds issued by the different provinces and by the States General were dealt in on the Amsterdam Exchange in the 17th century, this being the first instance of trade in Governmental debt. It is a great peculiarity that the bonds of the province of Holland were sometimes quoted 30 per cent. higher than those of the States General! The subsidies granted by the Government to foreign Powers (including Brandenburg and the German Emperor) being usually paid in these bonds, it was their (the Government's) interest to keep them well buoyed up, and so the politics of the seventeenth century were already governed for a great part by the Exchange, and especially the Amsterdam Exchange, at that time the foremost. The ambassadors carefully kept their respective Governments instructed as to the quotations of the Holland bonds. The German Emperor even declared that "Europe could not do without the money of the Hollanders."

The enormous wealth accumulated could in the seventeenth century still be employed in national trade, but the retrogression of business here in the eighteenth century, a consequence of the rise of neighbouring countries, deprived the capital of its natural employment and made it look for foreign investment. This was indeed repeatedly prohibited by the Government, for fear that foreign companies, backed by Netherlands capital, might compete with national enterprises, but in practice this prohibition was not duly enforced. Then gradually a brisk "hazard trade" grew up in the Netherlands. Already in the latter part of the seventeenth century option and premium transactions had been introduced on the Amsterdam Exchange, in the same form as they still prevail on the principal Exchanges of Europe. At

least, there was a plan in 1687 of putting a tax on these sales, but the measure was not carried through. But with the appearance of JOHN LAW, who endeavoured to provide money for France by his Bank and Mississippi Company, the speculative business in this country rose to a real frenzy. Great profits being made here at first, when these schemes met with distrust, the case altered very much after the founding of the Southsea Company and the Fishery Company in England. In this country similar undertakings were launched on a large scale, and in 1720 the total of new issues amounted to 1,150 millions of guilders, of which only a few could claim a sound basis. Usually an instalment of only 20 per cent. was asked, but in many cases a much lower percentage was deemed satisfactory. Of course there was no lack of serious disappointments, but the attraction of gambling on the Exchange had spread in a large circle and from that time Amsterdam became more and more the centre of the stock market and now also, even especially, of the trade in foreign securities.

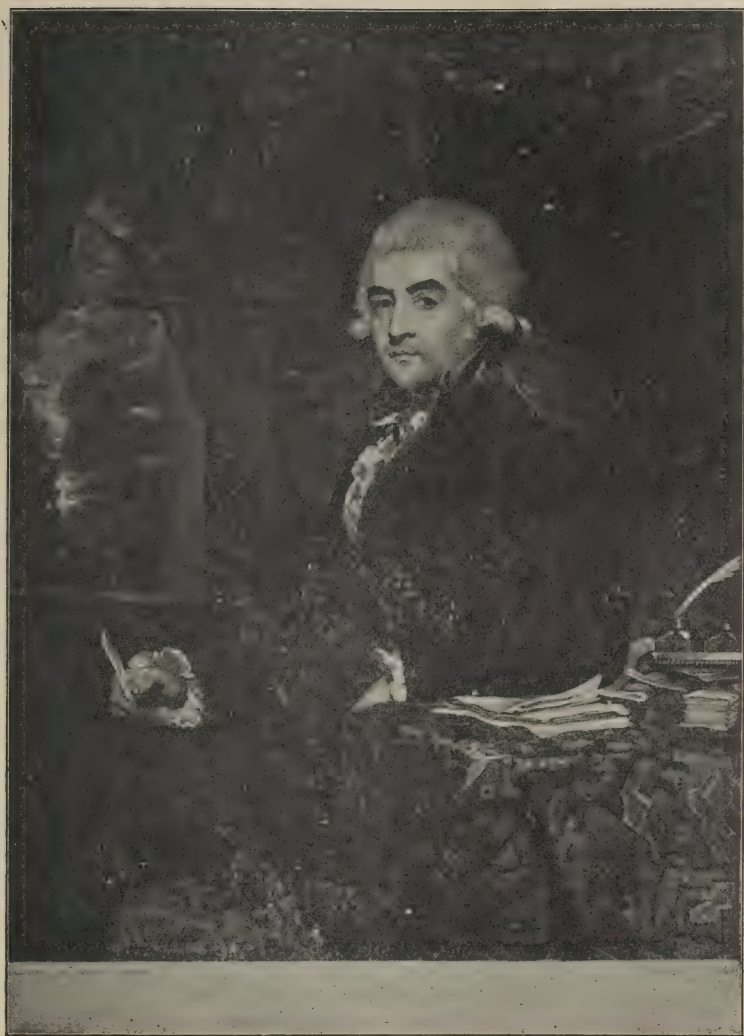
Like American stock afterwards, so in the 18th century English stock was preferred here. The Netherlands merchant realized that the United Kingdom was gradually taking the place in trade formerly occupied by the Netherlands. Shares in the British East India Company, in the Bank of England (founded in 1694 in imitation of the Amsterdam Exchange Bank of 1609) and in many English undertakings were in great demand. Of the British national debt, then amounting to £ 140 millions, £ 58 millions worth of bonds were held by Netherlanders, against £ 70 millions by British subjects, £ 8 millions by Swiss, £ 1 millions by Frenchmen and £ 2 millions by other European nationalities.

At that time Amsterdam was the money market not only of England but of the whole world. France, Austria, Denmark, Spain, Sweden, Russia, Poland, and all the German States contracted loans here, and the princes not only borrowed money here for their countries, but also for their own use and all sorts of private undertakings. There were already several loans for German mining concerns, and for plantations in our own colonies and in those of other countries,

including British America. This resulted occasionally in critical conjunctures, and so the years 1763 and 1773 are marked with a black cross in the annals of the Amsterdam Exchange. In the former a crisis occurred in consequence of the Mint being weakened by Frederic the Great, who required large sums at that time to carry on his seven years' war; in 1773 as a result of the bad position of the British East India Company and the decline of the West Indian possessions owing to a series of revolts. (Even as early as 1675 a number of Amsterdam bankers had been obliged to stop payment.)

However, the confidence in foreign loans was not destroyed, though the course of events had given some lessons. Thus, some Amsterdam firms, ABRAHAM VAN KETWICH and ABRAHAM VAN VLOTEN, together with some Haarlem gentlemen, established in 1774 at Utrecht an "Administration office," which issued certificates on a mutual property consisting of bonds of plantations and European States. Presumably this was the first office of that sort opened in this country, and it was afterwards followed by many more, either for national debt, American securities, the splitting for easier handling of bonds of too large an amount, mutual possession, or the like. These offices for mutual possession fully characterize the nature of the Netherlander, who will willingly run some risk, provided there be a reasonable chance of profit ensuing and the risk be duly divided.

As Amsterdam remained a financial centre of the front rank throughout the eighteenth century, it is quite natural that it attracted a great many foreign financiers. In fact, the leading men of many firms there bear names of an exotic origin. Thus the CLIFFORDS, who were ruined by the crisis of 1772—1773, were born English. The HOPES descended from the Scot HENRY HOPE, who settled in Rotterdam about 1660. His son ARCHIBALD carried on a trade with England and America, and HENRY, the son of the latter, established himself as a merchant and his father's agent at Boston. ARCHIBALD's second son, ARCHIBALD HOPE JR., settled as merchant in Amsterdam in 1720 and entered into partnership in 1726 with his brother THOMAS, to trade with England, America and West India. In 1734 this firm applied itself to the Banking



HENRY HOPE.



Messrs. HOPE and Co's Offices.

business, at first under the name of THOMAS & ADRIAAN HOPE and, from 1762, of HOPE & Co. Like the kindred firm in Rotterdam, the Amsterdam house engaged in the transport of emigrants to America. But they gained their highest fame by the Russian loans. In 1788 HENRY HOPE JR., born in Boston, succeeded in inducing CATHARINE II, Empress of Russia, whose confidence he had won, to entrust the financing of the loans to his firm. Before that time, i. e. since the first Russian foreign loan contracted in 1769, the Amsterdam firm of RAYMOND & THEODOOR DE SMETH had been the privileged party. Among the partners of HOPE & Co. we subsequently meet with many foreign names, including those of the Frenchmen NICOLAS BAUDOUIN and PIERRE CÉSAR LABOUCHÈRE, whose brother-in-law, ALEXANDER BARING, head of the London firm of BARING BROTHERS, in 1814 reconstructed the firm of HOPE & Co. Then the Frenchman P. F. LESTOPIS and the Hamburger JÉRÔME SILLEM were admitted as members to the firm. In the nineteenth century, however, the firm was outdone by the house of ROTHSCHILD, though the connections with Russia and America were continued and its front rank position in the Netherlands has remained unimpaired up to the present day.

Further, there were in Amsterdam several Swiss financiers in the eighteenth century, including the HOGGUERS, HORNECA, FIZEAUX, GRAND, &c.

The large investment in British loans above-mentioned finally became fatal to this country. The crisis of 1773 had had an injurious effect on the liking for British stock. So when about this time the American revolution broke out and England required enormous sums of money to quell it, Netherlands capital was expected in London to be at disposal, but in vain. Of the $5\frac{1}{2}$ per cent. loan only a trifle was taken up here, and of the $6\frac{3}{4}$ per cent. loan of £ 20 millions that soon followed, only £ 1 million was placed here. Seeing, further, that our countrymen maintained a profitable trade from the island of St. Eustatius with the American insurgents; that we saluted their ships; that their privateer PAUL JONES (whose name still lives in the Netherlands legendary song) was warmly received, and that Amsterdam in

1778 contracted a provisional treaty with the insurgents, to come into force when Britain should have acknowledged their independence, it is plain enough that England thought she had sufficient grievances for going to war with us and so curtailing the trade that was left us. In this our rivals in trade and colonial dominion succeeded so well, that since that time they have remained our superiors and soon put us also in the shade in financial matters. The ties with the United States, however, remained intact, and if in the nineteenth century, when this country also witnessed more prosperous days, the Netherlands persisted in showing great sympathy for the economic development of the United States, and supported this development by taking an ample share in the loans contracted by the American Government, Railways and Industrial Companies, it is owing for a great part to the friendly connections concluded during the revolution

The war with England hastened the dissolution of the Republic and was followed by the French domination, during which our trade was still further reduced by the Continental system, which prohibited all trade with England. One of the gravest consequences of the decay of our trade was the failure of the famous Amsterdam Exchange Bank, which enjoyed a universal renown and whose paper had always stood above its face value. It may be mentioned as a remarkable fact that the "giro" traffic, so widespread at present (and only just reviving in this country) had been carried by this Amsterdam establishment to a high degree of perfection. Owing to the bad general circumstances the bank was obliged in 1791 to stop payment. It appeared that large sums had been advanced to the East India Company and that the liabilities surpassed the assets by $2\frac{1}{4}$ million guilders. The town of Amsterdam, being responsible for the debts of the bank, borrowed 8 million guilders in 1795 and 7 million guilders the next year to meet the emergency. The debts were paid with 5 per cent. agio. In 1819 the Amsterdam Exchange Bank was finally declared non-existent. Besides this bank there were founded during the Republic: in 1616 the Middelburg Bank, and in 1635 the Rotterdam Bank, both of a local character.



The Rotterdam Bank.

After the downfall of NAPOLEON and the restoration of the independence of the Netherlands, the first care of the new king, WILLIAM I, was the regulation of the circulation system, for which purpose the Netherlands Bank was established. The king and his house invested largely in the share capital. The establishment was at first impeded by the opposition of the Amsterdam bankers, who fancied their existence was in jeopardy, and it lasted a long time before the public, outside Amsterdam, had full trust in the notes issued by the Bank. Gradually, however, the facilities offered by the circulation bank were recognised.

It is the only bank enjoying a Government charter. The Bank is a private company, not a State institution, but it has been established by a special bank act, which has been renewed with some modifications from time to time for a certain number of years, and its statutes have always had to be approved by the Government.

The management of the Bank is in the hands of a Board consisting of a President, five members and a Secretary. The President and the Secretary are appointed by the Government, the ordinary Directors by the shareholders. Besides these, there is a Board of Commissaires — what in the United States are called the Directors of a Company — forming a board of supervision, who are elected by the shareholders. Next to these there is a representative of the Government, who has to act as a special supervisor and to see that no infringement of the statutes occurs.

The Bank is the Government's banker, and the Government has the right to overdraw its account to a maximum of 15 million guilders (\$6,000,000). Beyond this the Bank is not allowed to grant a blank credit to the Government. Still, the Government, when issuing Treasury bills, very often discounts them at the Bank; but this must always be done through the intermedium of a third party, generally private bankers.

The Government shares in the profits of the Bank as a return for the monopoly of issuing banknotes.

The business of the Bank consists mainly in discounting bills of exchange and advancing money on national and

foreign stock and on goods. The advances on goods, however, only embrace a small part of the whole. Further, the Bank is entitled to buy and sell gold and silver.

The management is strictly commercial and is carried on entirely independent of the Government. The total of the notes in circulation, bank-assignments and balances of current accounts of private persons, was covered in the last financial year by an average of fully 50 per cent. of coin and



DR. VISSERING,
President of the Netherlands Bank.

bullion. Formerly the metal covering consisted mainly of silver, but at present 98 per cent. of it is gold.

The metal reserve of the Bank, the covering of the liabilities, must be held in coin and bullion. The coins may consist of gold coins and silver token-money.

When the Netherlands adopted the Gold Standard the existing silver coins were not demonetised and continued to form a part of the circulation as legal tender; but the Government had to maintain them at a parity of value with the standard, and in order to make proper provision the Minister of Finance (the Secretary of the Treasury) has been authorized by a special law to demonetise the silver coins if it should become necessary. This, however, has never been the case; on the contrary, quite recently it proved to be necessary to coin some additional token-money. The profit of this measure — on this coinage — has to be specially reserved for making good an eventual loss, should demonetising have to follow later on. For many years the silver token-money continued to form part of the circulation to a relatively large amount. Of late years, however, this has no longer been the case; the silver token-money having been exported to the Netherlands Indies, who have unity of currency with the Netherlands and where the silver coins of fl. 2.50 and fl. 1 find more employment than the fl. 10 gold coins.

However, from the moment of the adoption of the gold standard in the Netherlands the Bank took its measures to always be able to provide the banking community with gold coins or bullion — or with cheques on foreign places — when the foreign rates rose to the parity of the standard; and at the last renewal of the Bank charter the Bank formally engaged itself to do so.

So, practically speaking, the Netherlands at present constitute, with England and the United States, the only free gold markets. In the Netherlands and in England the Central Banks, as a matter of sound policy, do not object to withdrawals, and in the United States the market is free, because the Secretary of the Treasury is unable to object to it, even if his stock should be nearly exhausted. Thanks to this policy the foreign exchanges of the Netherlands have never exceeded the parities, so that our merchants can in their foreign transactions absolutely rely on it that the loss in exchange will never exceed the difference between the minimum and the maximum figures.

The average rate of discount charged on bills with three signatures was

in 1909	2.91	per cent.
" 1910	4.34	"
" 1911	3.56	"
" 1912	4.00	"
" 1913	4.65	"

The operating capital has risen in the last ten years from fl. 127 million to fl. 173 million.



Mr. C. J. K. VAN AALST,
President of the Netherlands Trading Company.

The cheque and giro-system is only moderately practiced in the Netherlands, which is the more remarkable as it was already largely applied by the Amsterdam Exchange Bank. The present managers of the Netherlands Bank, however,

intend to make use of it again when possible, and have already made some attempts in that direction.

The cheque and clearing system is much more popular in Java than in the Netherlands, as the Bank of Java, having the same position and charter for the Netherlands East Indies that the Netherlands Bank enjoys at home, has been using its influence very successfully in inducing the colonial citizens to adopt this modern practice in paying their debts.

In their report, which is issued both in Netherlands and in English, the Directors give the following interesting figures, relating to the official rate of discount of the principal central banks for the years 1898 to 1912:

	Number of Changes.	Highest.	Lowest.	Average.
France	14	4½	2	3.09 p. ct.
England	79	7	2½	3.69 „
Germany	62	7½	3	4.59 „
The Netherlands.....	31	6	2½	3.59 „
Belgium	39	6	3	3.74 „
Switzerland.....	58	6	3	4.18 „
Austria-Hungary	25	6	3½	4.33 „
Java	14	6½	3½	3.74 „

More than anything else the last figure shows how a sound banking law and an able management can enhance a country's welfare! An average rate of 3.74 per cent. in colonial possessions is something unknown in other parts of the world, and explains why the Governments of China and of the British East Indian Colonies are trying to profit by the Java example, the former President of the Bank of Java, Dr. VISSERING (now President of the Netherlands Bank) acting at present as Honorary Adviser to the Chinese Government.

That the above-named period has been one of increasing development of our colonies appears from the following figures of the Bank's liabilities:

	Highest.	Lowest.
1901 . . . fl.	65,000,000	fl. 57,000,000
1908 . . . „	87,000,000	„ 70,000,000
1913 . . . „	130,000,000	„ 115,000,000

In the last four years the Java rate was kept constantly at $3\frac{1}{2}$ per cent., while in British India the rate of the Presidency Bank of Bengal fluctuated every year between 8 or 9 and 3 per cent.; the rates of exchange on London fluctuating in proportion.



Java Bank, Batavia.

The Netherlands West Indian possessions also enjoy the advantage of a central bank of issue.

After the restoration of the independence of the Netherlands trade languished for a long time. In order to improve this state of affairs and to reanimate the traffic with our rich colonies in East India, King WILLIAM I initiated the establishment of the "Nederlandsche Handel Maatschappij" (Netherlands Trading Company) (1824), in which he again



Head Offices of the Netherlands Trading Company, Amsterdam.

invested largely. The Company received the monopoly of conveying and selling the Government products, chiefly consisting of coffee, tin and tobacco. This caused an important amelioration, and ever since the trade with the colonies and in colonial produce has been on the increase. We may mention, for instance, that in 1913 the production of sugar in Java amounted to fully 23,500,000 piculs (1 picul = $61\frac{3}{4}$ kilogramme = 126 Eng. pounds), and was sold at fl. 6.80 to 7.75 per picul, and therefore represented a value of over $171\frac{1}{4}$ million guilders. The value of the tobacco crop of 1913, realized in 1914, amounted to fl. 72.5 million (viz., fl. 49.6 million from Sumatra, fl. 21.4 million from Java and fl. 1.5 million from Borneo), against a crop in 1912 of fl. 92.2 million and in 1911 of fl. 100.5 million. The export of coprah amounted to 174,541 tons, worth about fl. 63 million; of tin about fl. 42 millions' worth was exported; of rubber 6,000 tons, worth about fl. 22.5 million. The coffee crop in 1913 yielded fully 570,000 piculs, representing a value of upwards of fl. 24 million; the tea crop over 59 million halfkilogrammes, to a value of about fl. 25 million. Of kapok the export comprised fully 9,000,000 kilogrammes, worth about fl. 6 million. The value of these products alone thus ran up in 1913 to more than fl. 426 million (\$ 170,500,000).

By the side of the Netherlands Trading Company a number of other colonial credit corporations sprang up in the course of years, of which the principal ones are: the "Nederlandsch-Indische Handelsbank" (Netherlands Indian Trade Bank) at Amsterdam; the "Internationale Crediet- en Handelsvereniging" (International Credit and Trade Association) at Rotterdam; and the "Nederlandsch Indische Escompto Maatschappij" (Netherlands Indian Discount Company) at Batavia. Important colonial undertakings are: the "Cultuur Maatschappij der Vorstenlanden" (Plantation Company of the Principalities), the "Handelsvereniging Amsterdam" (Amsterdam Trade Association) and the Colonial Bank, all in Amsterdam.

Besides these colonial enterprises the Netherlands possess a number of private banks, that occupy themselves with trading in bills of exchange, stocks, foreign securities, &c.;

they also accept deposits of money, advance money on goods and stocks, open credits to merchants and manufacturers and let safe-deposits. The mortgage business is carried on by special banks.

	Capital and Reserves.	Deposits and bal- ances of Current Accounts.
Rotterdamsche Bankver. fl.	38,000,000	fl. 77,000,000
Twentsche Bankvereeniging. „	22,000,000	„ 81,000,000
Amsterdamsche Bank „	24,000,000	„ 55,000,000
Incasso Bank „	13,000,000	„ 28,500,000

Besides these there are a great number of savings banks, who accept small deposits for saving purposes. The principal one is the Government Post Office Savings Bank, which at the end of 1912 held fl. 177,000,000 in deposits.

The most important banking firms are settled at Amsterdam; besides the house of HOPE & Co. already mentioned the most prominent are: ALSBERG, GOLDBERG & Co.; ADOLPH BOISSEVAIN & Co.; BOISSEVAIN BROS; LIPPMANN, ROSENTHAL & Co.; H. OYENS & SONS; TEIXEIRA DE MATTOS BROS; VERMEER & Co; WERTHEIM & GOMPERTZ and WURFBAIN & SON; further, at Rotterdam, the firm of R. MEES & SONS, which dates from 1720.

The big banks are all members of the Amsterdam Stock Exchange, where business is carried on under self-made regulations, independent of Government control, in the Exchange building of the Association for the Stock Exchange, established in 1876. The Board of this corporation is chosen by the members from among themselves. Before the said year there existed a "General Exchange Committee for Public Stock". The business on the Amsterdam Exchange approaches nearest to that on the Exchange of New York. Here also it consists of ready cash negotiations. Loans on stocks are concluded for one month (with right to prolongation) or on call. The number of members of the Association is at present about 700.

The official price-current (stock list) contains the names of about 1,800 sorts of stocks, among which are 250 American, namely: 47 shares and 123 bonds of railway companies

and 59 shares and 21 bonds of industrial undertakings. The American section belongs to the most lively of the Exchange, and it may safely be said that Amsterdam and London are the most important markets for American stock in Europe. Besides Americans, a brisk business is also done in petroleum shares (Royal Netherlands), tobacco shares (Deli Company, Senembah, Deli Batavia), sugar and rubber shares, shipping shares, Indian railway and tramway shares, &c.



Head Offices of Ad. Boissevain & Co., Amsterdam.

While the Netherlands had already in the 18th century granted loans to the young American republic, the financial relations between the two countries were particularly tightened in the 19th century. This was not only owing to tradition but also to many Amsterdam shipowners being personally

acquainted with the new world, whose fabulous development they witnessed at close quarters. The enormous demand for capital, both from the side of the Government (especially during the war between the Northern and the Southern States) and from that of private enterprises, particularly the railway companies, could not fail to attract their attention. The opportunity for profitable investments thus offered to Netherlands capital was amply made use of, and the public here has still preserved a particular predilection for American stock, by preference of a speculative nature, notwithstanding many disappointments. (In 1825, for instance, bonds were issued for a loan of the State Poyais, which did not even exist, as was afterwards proved). Quite lately there has been some change in this respect.

Among the first shares negotiated on the Amsterdam exchange were those of the Philadelphia Bank, in original shares and certificates issued by the administration office under the direction of Messrs. HOPE & Co., KETWICHEN VOOMBERGH and the Widow W. BORSKI; the last dividend on these shares was paid in 1839. Bonds of this Bank, namely: those of 1839 (ROTHSCHILD) and 1840 (HOPE & Co.) were also held here in considerable quantity. As the Bank failed to pay interest on these loans the bondholders received certificates of joint-ownership of the American stocks pledged for the said loans, and consisting of a large quantity of 5 and 6 per cent. bonds of American States and Canal Companies, to which were afterwards added 7 per cent. bonds of the New Jersey Central Railway Company and 8 per cent. bonds of the Michigan Central Railway Company. This greatly increased the acquaintance with American stocks. The 5 per cent. bonds of the State of Louisiana, issued in the name of the Citizens Bank of Louisiana and emitted in 1836 by HOPE & Co., were also known here pretty early.

Especially since the beginning of 1863 the flood of American State bonds has swollen considerably here. Besides many loans of the Northern States, there came the 7 per cent Cotton loan and the 8 per cent. loan of the Confederates, which both became valueless. Further, 6 per cent. bonds of the State and city of New York, 8 per cent. bonds of Florida,

the remembrance of which is far from agreeable, 8 per cent. bonds of the town of Mobile, &c. Many Netherlanders still have a particular grievance against the State of Mississippi, for having shamefully disappointed its creditors.

Until the year 1868 the only railway stocks negotiated on the Amsterdam Exchange were those of the Illinois Central Railway Company, the Atlantic Great Western Railway Company, the St. Paul & Pacific Railway Company and the Galveston, Houston & Henderson Railway Company. Both the 7 per cent. St. Paul & Pacific bonds (afterward also 10 per cent. receivers' certificates), which were nearly all taken up in this country, and the 8 per cent. Galveston, Houston & Henderson bonds (which company had contracted more loans than was made known here) are still kept in sad remembrance. After 1867, when an extraordinarily vigorous construction of railways began in the United States, the number of American companies in which Netherlands capital was invested augmented to such a degree, that about 1873 some 60 could be named, many of which are still intimate acquaintances of the Netherlands public, viz., the Erie Railroad; the Chicago, Rock Island & Pacific Railway Company; the Union Pacific Railway Company; the Central Pacific Railway Company; the Denver & Rio Grande Railway Company; the Missouri, Kansas & Texas Railway Company; the Chesapeake & Ohio Railway Company; the Atchison Topeka & Santa Fe Railway Company, &c. Others there were whose names are already consigned to oblivion, like: Rockford, Rock Island & St. Louis; South Missouri Pacific; Denver & Boulder Valley; Port Huron & Chicago; Elizabethtown & Paducah; Paducah & Memphis; Port Royal; Toledo, Peoria, Warsaw; Gilman, Clinton & Springfield; Morris & Essex; Marietta-Pittsburg; Boston, Hartford & Erie; &c.

This shows that Netherlanders have not been backward in supplying the United States with the means for the construction of the extensive net of railways that has contributed so much to the development of the great Republic. But the consequence was that the Netherlands suffered enormous losses during the several crises which have visited the

United States in the course of the last 40 years. The losses incurred here by the great fall of American railway stock in 1873 were estimated at several hundred million guilders. The continual retrogression of American railway stock from 1881 to 1884, culminating in the crisis of the latter year, claimed numerous victims here. To give an idea of the decline we subjoin a list of a few stocks showing the quotations in those years side by side :

	1881.	1884.
Atchison Topeka	154	60
Central Pacific	105	30
Denver Rio Grande	113	7
Eric	52	12
Louisville & Nashville.....	110	24
Union Pacific.....	128	28
Pref. Wabash St. Louis.....	99	10

Heavy losses occurred again through the silver crisis that raged from 1893 to 1896, and which brought the Atchison, Topeka & Santa Fé, the Northern Pacific, the New York, Lake Erie & Western (now Erie Railroad), the Philadelphia & Reading, the Richmond & West Point Terminal (now Southern Railway) and the Union Pacific and others into the hands of receivers. For the ensuing reorganisations the Netherlands public have as a rule willingly complied with the receiver's requisitions and in most cases not to their disadvantage. Atchisons, which in 1895 were quoted at 4 per cent., had risen again to 89 in 1906 ; Union Pacific common rose from 5 per cent. in 1897 to 127 per cent. in 1901.

It lies in the nature of Netherlanders to sell stocks of this kind when they have risen to about par, by reason of their then becoming "too heavy", as the saying goes. So, after the recovery of the railway market huge quantities of Union Pacific, Southern Pacific, Atchison, Topeka, Norfolk & Western, Baltimore & Ohio, Canadian Pacific, &c. went back across the Ocean, and the investments were transmitted in many cases from these companies to such as common and preferred Rock Island Company, common Missouri, Kansas & Texas, Erie Railroad, Denver & Rio Grande, Southern

Railway, common and preferred Kansas City Southern, &c. Presumably the greater part of the stock of this Company is in the hands of Netherlanders.

Since the beginning of the present century our countrymen have also invested large sums in American manufacturing enterprises, especially those of the U. S. Steel Corporation, American Car & Foundry, American Smelting and Refining, American Smelting Securities Company, American Telephone & Telegraph Company, &c. Common Steels were bought here in large quantities when they fell to 9 per cent. and lower, so that these investments were estimated about 1907 at \$ 55,000,000, but a few years later they had receded again to about \$ 20,000,000.

Our countrymen have also largely invested in common and preferred shares and $4\frac{1}{2}$ per cent. bonds of the International Mercantile Marine Company, which have undoubtedly their best market in Amsterdam. Further, the Netherlands public hold considerable stocks of sundry American trading corporations, like: The United Cigar Manufacturers Company, the Associated Merchants Company, the United Dry Goods Company, the May Department Stores Company, the Sears Roebuck Company, &c., while of late years a number of public utility stocks have been introduced here.

After the foregoing it will be quite plain that the crisis of 1907 has been very detrimental to this country, but it would be untrue to assert that it had diminished the liking for American stocks. We should rather be inclined to adhere to the contrary, for in the boom years closely succeeding the crisis, a brisk speculation in American stocks prevailed here again. It is only the breakdown of a great number of American railway and other companies in which this country was interested that has been able to somewhat repress the national predilection for "Yankees".

It would be making a considerable omission to finish without mentioning the extensive business of a large number of Netherlands mortgage banks, who advance money on land or buildings in the United States and Canada, against which they issue bonds in the Netherlands.

Especially of late years the number of these banks has

largely increased, and we estimate the Netherlands capital thus invested in America to be far above \$ 50 million.

The foregoing will surely have convinced the reader that the tie formed three centuries ago between Old and New Netherland has not yet been slackened, though the union is now supported more by the strings of the purse than by political interest. We know that thousands in the great and powerful Republic pride themselves on having in their veins the blood and bearing the name of one of those staunch pioneers who made the name of the Netherlands known and respected as far as the most distant shores and, if necessary, also feared. On the other hand, America can rest assured that our little country is proud of having contributed to the extent of its power to the economical development of the "land of the boundless possibilities". That this contribution has not been a trifle is proved by the foregoing, and its significance is all the more obvious if we remember that the State of New York alone is four times as large as the Netherlands and that the area of the United States has space for 284 countries of the size of ours.

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HOLLAND ON THE SEAS BY J. H. COHEN
STUART, LATE MANAGER IN AUSTRALIA FOR THE
"KONINKLIJKE PAKETVAART MAATSCHAPPIJ".

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no. 11

HOLLAND ON THE SEAS

BY

J. H. COHEN STUART,

*Late Manager in Australia for the "Koninklijke
Paketsvaart Maatschappij".*

I. HISTORICAL REVIEW.

FACING the North Sea on two sides, and controlling the estuaries of all the great rivers of North Western Europe — Rhine, Meuse and Scheldt — it would be strange if the Hollanders had ever been anything else but a seafaring nation. It has almost become a tradition to speak of Holland as a country whose very existence is a conquest of human energy and intellect upon the elementary force of water. And it would indeed be difficult to say which has been the Dutchman's ¹⁾ greater achievement: to have secured the land on which he lives from the encroachments of sea and rivers — or to have utilised those very waters as a means of creating trade, wealth and prosperity.

However this may be — there is no country (with the possible exception of Great Britain) whose history is so closely bound up with the sea as Holland, and whose citizens have been so renowned throughout the ages for their skill as shipbuilders, navigators, and hydrotechnical engineers.

¹⁾ The author is aware of the American custom to apply the names "Dutch" and "Dutchmen" to Germans. The fact that the latter call themselves "Deutsche" no doubt accounts for this custom. This is not, however, in accordance with the historical origin of the English name, which has never applied to any other nation but the inhabitants of the Netherlands or their descendants (like the Boers in South Africa). In order to avoid all misunderstanding the words Netherlands and Netherlanders or Hollanders have been used as far as possible.

**Holland's
Early Sea Power.**

In these days of worldwide commerce and international rivalry when there is hardly a nation without its own mercantile marine — or at least the ambition to possess one — it is difficult to realise that the time is not so very far distant when little Holland all but monopolised the sea-carrying trade of Europe — if not of the world. Its exceptional geographical situation and the enterprise of its merchants made Holland, and especially Amsterdam, a natural centre of trade and industry long before the remainder of Europe had emerged from mediaeval darkness and primitive economical life. And although other nations have since arisen and developed into powerful Empires, they have been unable to rob Holland of its natural advantages, nor the Hollanders of their enterprise and skill as merchants and navigators.

The days are past when it could be Holland's proud boast that "the keys of the Sont were kept in Amsterdam" (indicating that this country with its powerful navy, controlled the Baltic and its approaches); — or when Admiral TROMP could hoist a broom on his mast, to indicate that he had swept the sea clean of enemies. But a nation with traditions like these will never fail — to use the words of the Queen-Mother of the Netherlands — "to be great in all such things in which even a small nation can be great."

**Holland's
mighty Fleets.**

Reports or diaries written about the beginning or middle of the seventeenth century by travellers or foreign ambassadors at The Hague, concur in their admiration and surprise at the sight of the great "forests of masts" in the port of Amsterdam. But not only Amsterdam — many of the now, alas "Dead cities" of the Netherlands, and especially those around the Zuyder Zee, were then ports of great importance, whence enterprising owners despatched their fleets to all ports of the Baltic and North Seas, to the Mediterranean and the Levant, and even farther afield, across the Atlantic or to Africa and the East Indies, China and Japan.

Sir WALTER RALEIGH, English ambassador in the Netherlands, reported about 1600, that the English had no more than 300 vessels in the Baltic trade, against the Hollanders 3000, while the latter had 2000 more in other trades. Altogether, the Hollanders owned as many ships as eleven European nations combined — Great Britain included. COLBERT, the famous French statesman, wrote 50 years later: "The sea trade of Europe is carried by 25000 ships. Of these, 14000 or 15000 belong to Holland, and only 600 to France."



Amsterdam about 1670.

Hollanders as Bees of the World. Another observer compared the Netherlanders with the bees, because they drew their wealth from all parts of the globe, like the bees suck honey from the flowers in the field. And a French traveller wrote of Amsterdam: "As many as three or four thousand vessels may be found lying in port on one and the same day. Twice a year, fleets of from four to five hundred ships each arrive, laden partly with corn from Dantzic, partly with wine and salt from France and Spain. Other fleets arrive from time to time from the Indies and other newly discovered countries, filled with spices and all kinds of precious goods."

From Amsterdam, these goods and products were distributed all over Northern and Central Europe.

Eighty Years' War.

It must be remembered that all this trade sprang up while Holland was at war — the famous "Eighty Years' War" — from which it emerged, victorious and free, in 1648. What is more: this trade had, to a large extent, been wrested from the hands of the enemies (Spaniards and Portuguese), for many years previously the undisputed masters of the far Eastern and Western seas. The Netherlands merchants used to obtain all Eastern products in Lisbon from the Portuguese, but when, by order of King Philips II of Spain, this market was closed to them, they at once set out to discover for themselves the trade routes to the Far East and other distant parts of the globe.

Dutch East India Company.

The (Dutch) East India Company, founded in 1601, embodied all this oversea enterprise, and soon spread its "factories" or agencies all over the East: — India, Persia, Ceylon, Siam, Japan, the East Indies. Other Companies directed their energies towards Brazil and the West-Indies. And so, all through the seventeenth and the first half of the eighteenth centuries, we find the intrepid Dutch sailors exploring the oceans, discovering new countries, founding settlements, and carrying their tricolor to the remotest corners of the earth ¹). Indeed, the map of the world is dotted with names reminding us of the achievements of these early Netherlands navigators, whose merits are in no way lessened by the fact that their object was trade rather than scientific research.

Early Sea Voyages and Discoveries.

After a fruitless attempt in 1595/96 to find a new and shorter route to the East through the Arctic Ocean (of which the name "Barentsz Sea" is a lasting memento), the first Dutch trading ships reached Java via

¹) It is not, perhaps, generally known that the Netherlands flag (red, white and blue) is one of the oldest now existing. Only the Spanish and Danish flags are more ancient. Even the Union Jack is of much more recent origin.

the Cape of Good Hope in 1600. Batavia — to this day the capital of the Netherlands possessions in the East — was founded in 1619. About the same time, in 1607, HUDSON, commanding the Dutch ship "Halve Maen" (i. e. Half Moon) discovered the river that still bears his name, and, seven years later, New Amsterdam (now New York) was founded on its banks. Formosa became a Netherlands possession in 1624. A large portion of Brazil was captured from the Portuguese in 1630. So was Ceylon, in 1658. JAN VAN RIEBEECK,



PAST —

"De Halve Maen".

(An exact replica of Hudson's ship: now lying in Hudson River,
Palissade Park, New-York).

a servant of the Netherlands East India Company, was the founder of Cape Colony in 1652. Dutch navigators discovered and named the fifth continent, New Holland (now Australia) about 1607. TASMAN's famous circumnavigation of this "great Southland" and his discoveries of Van Diemen's Land (Tasmania) and New Zealand took place in 1642-44. Cape Horn, Strait Lemaire, Mauritius, are a few more names of Dutch origin.

**Holland —
Cradle of Maritime
Science.**

It will be remembered that, on the occasion of the Hudson celebrations in 1907, the City of Amsterdam presented the City of New York with an exact replica of the "Half Moon", which headed the international naval procession on the Hudson River. Many who witnessed the impressive spectacle, and saw this tiny cockle-shell side by side of the huge transatlantic liners, must have stood amazed at the enterprise of men who, three hundred years ago, dared to cross and explore the Oceans in such vessels — with imperfect charts and instruments, and often without any charts at all.

It may be imagined with what keen interest such men were received on their return home, and how eagerly their published narratives were bought and read by all seeking information about the then unknown parts of the world. The ships' journals, sailing directions, books of travel and charts published in the Netherlands during the seventeenth and eighteenth centuries were wonderful productions in every way, but it is particularly interesting to compare the earlier with the later publications, and to note the gradual progress in scientific thoroughness, due to the invention or perfection of maritime instruments, or to improved methods of observation or research.

As a matter of fact, Holland in those days was something like the world's school in maritime (as well as many other) matters and attracted distinguished students from all parts of Europe. It is well known how PETER THE GREAT, Tsar of Russia, came to Amsterdam to learn the carpentering and shipbuilding trade, and afterwards invited a number of Dutch shipwrights and naval men to Russia to build and man the first Russian war-ships. The first Russian Admiral was a Hollander. Even today the Russian maritime language is full of Netherlands words and names ¹⁾.

¹⁾ As an interesting sequel, it may be mentioned that, one hundred and fifty years later, in 1857, Netherlands laid the foundation of the Japanese Navy. The Government of the Netherlands presented the Mikado with a steamship which became the first Japanese man-of-war. Netherlands naval officers and engineers instructed Japan's first naval cadets, several of whom have lived to play a prominent part in the Russo-Japanese War.

English and French Competition. The marvellous rise of the Dutch Republic, the proverbial and increasing prosperity of its citizens, and the rapid growth of Amsterdam as the commercial "hub of the world" naturally aroused not only the admiration, but also the envy of the older Powers of Europe, and especially England and France.

It was left to CROMWELL to deal the first blow to Holland's maritime power by means of the Navigation act (1651),



— and PRESENT.

The "Statendam" (32500 tons) of the *Holland-America Line*.

stipulating that no goods might be imported into Great Britain except by British vessels or by ships owned in the country whence the goods came. As Holland was practically the only shipowning country of importance outside England, the Act at once excluded a large portion of the Netherlands merchant fleet from the lucrative British trade, while at the same time it stimulated British enterprise and British ship-building. Similar measures were taken by France to foster her national mercantile marine.

Anglo-Dutch Wars.

The (first) Anglo-Dutch war which followed in 1652, was a direct result of CROMWELL's hostile policy, and the beginning of that keen struggle for sea power which lasted for over a hundred yaers. Those were the days of TROMP and DE RUYTER, and other famous heroes of the sea, whose memory will always live, and whose names will for ever remain the pride of the Netherlands nation.

Within twenty years, there were no less than three wars with England, but neither of these proved decisive. The



Dining Saloon s.s. "Prins der Nederlanden" (*Nederland Line*).

second war (1665—1667) ended with DE RUYTER's famous raid on the Thames, and during the third (1672—1674) the Netherlands remained victorious in practically every engagement, sometimes against heavy odds.

The decline of Holland as a sea power is supposed to have set in about the beginning of the eighteenth century, though

her oversea trade, especially to and in the Far East, remained considerable. GROSE, an English traveller, writing in 1770, stated that "the power of the Dutch by land and by sea is very great in the East Indies, where by force, address and alliances, they raised themselves, and still support a great superiority, in spite of the English, Portuguese and other Europeans, that have some trade there, but so inconsiderable that, all together, it is not equal to what the Hollanders singly enjoy." He then enumerated no less than sixty-five settlements of the Dutch East India Company throughout the East, all supported by numerous troops and ships.

Holland and American Independence.

Unfortunately, the Netherlands thought more of their trade than of the means to protect it. They allowed their navy to fall far behind the English, with fatal results to themselves. When the American War of Independence broke out, it soon involved not only France, but also the Dutch Republic, whose democratic sympathies led to popular demonstrations in favor of the "rebellious colonists" in the New World. The Governor of the Dutch island of St. Eustatius, in the West Indies, allowed an American warship to capture an English merchantman in Netherlands territorial waters, and even ordered a salute to be fired for the American colors. When PAUL JONES, the famous privateer, arrived in a Netherlands port with two English prizes, he was warmly received and cheered by the population, while the Government refused to comply with the British ambassador's demand to have the "rebel" arrested. Other incidents increased the irritation in England, and so, in 1780, the fourth war between the two countries broke out.

Decline of Dutch Republic.

It seems a pathetic coincidence that one and the same generation should witness the decline and fall of one of the most famous Republics the world has known — and the birth of another mighty commonwealth on the other side of the Atlantic.

The war with England lasted four years, and its effects were disastrous for Holland. Hundreds of her merchant ships were captured or destroyed, several of her colonies taken, and her trade and shipping generally paralysed. When peace came, the country was in a deplorable condition, and before it had time to recover, the French Revolution followed, and, with it, the general upheaval of Europe.

Under French auspices, the "Batavian Republic" replaced in 1795 the old Dutch Republic, and, as France was at war with Great Britain, the Netherlands too became involved.

**Napoleon's
Continental System.**

It is hardly necessary to pursue Holland's fate throughout the "Napoleonic era" — suffice it to say that during this period she lost every one of her colonies and practically the whole of her mercantile marine. The most fatal blow of all was dealt to her sea trade through the so called "Continental System", by means of which NAPOLEON hoped to break England's sea power. It was nothing more nor less than a gigantic boycott declared against all English trade all over the continent of Europe, but its effect was merely to stimulate British trade with other parts of the world, thereby laying the foundations for the British World Empire of today.

Holland's Revival.

When, after nearly twenty years of war and oppression, Holland regained her independence and became the Kingdom of the Netherlands, there was a big task awaiting the nation. Ruined financially, exhausted in every sense of the word, her oversea trade, her ships and nearly all her colonies gone, the immediate prospects seemed far from bright. Fortunately, the East Indies had been restored to her, and, amidst a general revival of enterprise and energy, no time was lost in re-organising the Eastern trade.

With this object in view, the *Netherlands Trading Society* was established in 1824, with the personal support and

**Netherlands
Trading Society.**

financial participation of King WILLIAM, who evinced the keenest interest in the country's economical needs. This Company was intended to carry on the traditions of the defunct East India Company and, generally, to foster the trade, shipping, industries, and fisheries of the Netherlands. The Government entrusted the Company with the shipment and sale of East Indian pro-



s.s. "Insulinde" (*Rotterdam Lloyd*).

ducts, upon condition that only Netherlands ships should be employed in this trade. This, and the lucrative freights guaranteed by the Government led to a speedy revival of the shipbuilding industry, which was further stimulated by a system of premiums and bounties.

**Holland
reaches fourth
place in World's
Sailing Fleets.**

These protective measures were undoubtedly helpful in creating a mercantile fleet that compared favorably with those of other countries, and by 1860 Holland had reached the fourth place amongst the

shipping nations of the world — only Great Britain, the United States and France being ahead of her in tonnage owned. But altering conditions — more especially the introduction of steamships and the opening of the Suez Canal in 1869 — caused a gradual decline of the world's sailing fleets, and Holland was no exception.

Only in a few trades, like the Australian and South American (more particularly in the Chilean saltpetre trade) Netherlands sailing ships held their own for a number of years. They were, however, gradually sold off to foreigners, chiefly Norwegians, until, in 1911, the last Dutch sailing vessel of the larger type was disposed of in this way.

The following summarises the history of the Netherlands sailing fleet since 1860: —

Year.	Fregates.	Barques.	Brigs.	Schooners.	Smaller Ships *).	Total.
1860	133	375	105	No Particulars available.		1985
1870	121	217	114	423	649	1434
1880	62	170	87	274	334	927
1890	12	122	27	109	288	458
1900	11	31	4	57	274	377
1910	1	3	—	60	388	452
1913	—	—	—	41	386	427

*) Over 100 tons gross only.



Holland Steamship Co's Fleet and Wharves Amsterdam.

II. RISE OF MODERN SHIPPING COMPANIES.

The new era in the history of shipping which set in about the middle of last century with the change from sail-to steam-power, coincided with a wave of liberalism and "freetraderism" over a great part of Europe, and the Netherlands were one of the first countries to adopt this tendency.

Freetrade versus Protection.

Without entering into any controversy upon a matter which will never cease to be a very debatable one, it may be said that this change of policy in the 'fifties led to an increase in the general trade and prosperity of the Netherlands, so that the results were in many respects beneficial. On the other hand it must be admitted that some industries, and more particularly the shipbuilding industry, suffered, as shipowners generally did not feel inclined to embark upon any fresh enterprise until the effects of the new free trade policy became more visible. In this way the rise of steamship companies in the Netherlands may have been somewhat retarded.

Ports and waterways.

There were, however, other causes which, for a considerable time, hampered the free development of the Netherlands mercantile marine. One of these causes was the unsatisfactory condition of the great ports of the Netherlands — more especially Amsterdam and Rotterdam — and the approaches to these ports.

Both were so situated, that they had no direct and easy access to the open Ocean, which perhaps was no serious drawback in the old sailing days but which became a serious obstacle in the more strenuous days of the steamship, especially with such formidable rivals as Hamburg, Bremen and Antwerp to contend with.



Shipping on River Meuse, Rotterdam.

The „New Waterway” (being Rotterdam’s „short cut” to the North Sea via Hook of Holland) was completed in 1872, and four years later the North Sea Canal gave Amsterdam direct access to the sea via IJmuiden. Both were engineering works of great magnitude, and demonstrated once more the proverbial skill of Holland’s hydrotechnical engineers.

Amsterdam and Rotterdam.

It is interesting to compare the historical development of Holland’s two principal ports, and the part they play in the world’s trade to-day.

Amsterdam, once Europe’s greatest trade emporium, has lost much of its former importance as a market for many products which now find their way direct to other Continental and British ports. It still remains, however, one of the most important markets for Eastern products, while it is also the seat of several of the leading Netherlands steamship companies.

Rotterdam is, compared with Amsterdam, a very young port. In fact, it was not until the completion of the New Waterway that Rotterdam became a serious rival of Amsterdam. Since then it advanced by leaps and bounds and to-day its annual clearings not only far surpass those of Amsterdam, but even Antwerp has fallen behind, so that Hamburg is the only port on the Continent whose annual shipping traffic exceeds that of Rotterdam ¹⁾. From the subjoined comparative statement it will be seen that during the last 23 years, Rotterdam’s aggregate clearings have increased nearly fivefold, as against Hamburg and Antwerp less than threefold.

The main difference between Amsterdam and Rotterdam, and the principal cause of Rotterdam’s predominance lies in the fact that Rotterdam forms the natural entrance to, and outlet from the German “Hinterland,” with which it is connected by the greatest of Europe’s rivers: the Rhine. Amsterdam is not so favorably situated in this respect, though it is

¹⁾ These statements refer, of course, to the position prior to the outbreak of the present war.

PRINCIPAL CONTINENTAL PORTS COMPARED :

Annual Tonnage, Entered and Cleared.

PORTS.	1890.				1900.				1910.				1913.			
	Entered.		Cleared.		Entered.		Cleared.		Entered.		Cleared.		Entered.		Cleared.	
	Number	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
Rotterdam . .	4 476	2 863 004	4 516	2 894 121	6 739	5 970 395	6 508	5 762 967	8 249	9 237 371	9 522	11 001 754	9 706	12 314 777	9 945	12 208 226
Amsterdam .	1 593	1 014 400	1 664	1 053 681	1 900	1 459 736	1 946	1 511 996	2 016	2 016 140	1 906	1 961 965	2 237	2 068 671	2 456	2 392 054
Hamburg . .	6 978	4 815 327	6 040	3 831 535	9 774	7 348 630	9 546	5 551 773	12 582	11 573 292	12 785	8 776 798	14 064	13 141 362	13 745	10 324 437
Bremen . . .	1 055	163 474	745	129 062	3 553	2 353 300	3 207	1 988 888	5 576	4 129 998	5 804	4 157 406	6 323	5 251 267	6 394	5 205 521
Antwerp . . .	4 532	4 517 698	4 540	3 842 500	5 244	6 691 791	5 249	5 673 817	6 770	10 756 030	6 781	10 769 286	7 056	12 084 796	7 071	12 029 057

served by a splendid system of canals communicating with the Rhine and the Meuse.

Until recent years, Rotterdam had to depend almost exclusively on foreign steamship lines for its oversea connections, but lately the number of local shipowners has increased very considerably.

SUMMARY OF NETHERLANDS STEAMSHIP OWNERIES.

(Vessels in commission or building on Jan. 1st 1915).

Owneries, where established.	Regular Lines.			General Shipping.		
	Number of owneries.	Number of ships.	Gross tonnage.	Number of owneries.	Number of ships.	Gross tonnage.
Amsterdam {	6 2 *	133 104	545.408 221.128	3	28	34.873
Rotterdam	9	74	454.564	22	113	311.651
Other Ports	4	10	16.905	5	34	54.950
Total	21	321	1,238.005	30	175	401.474

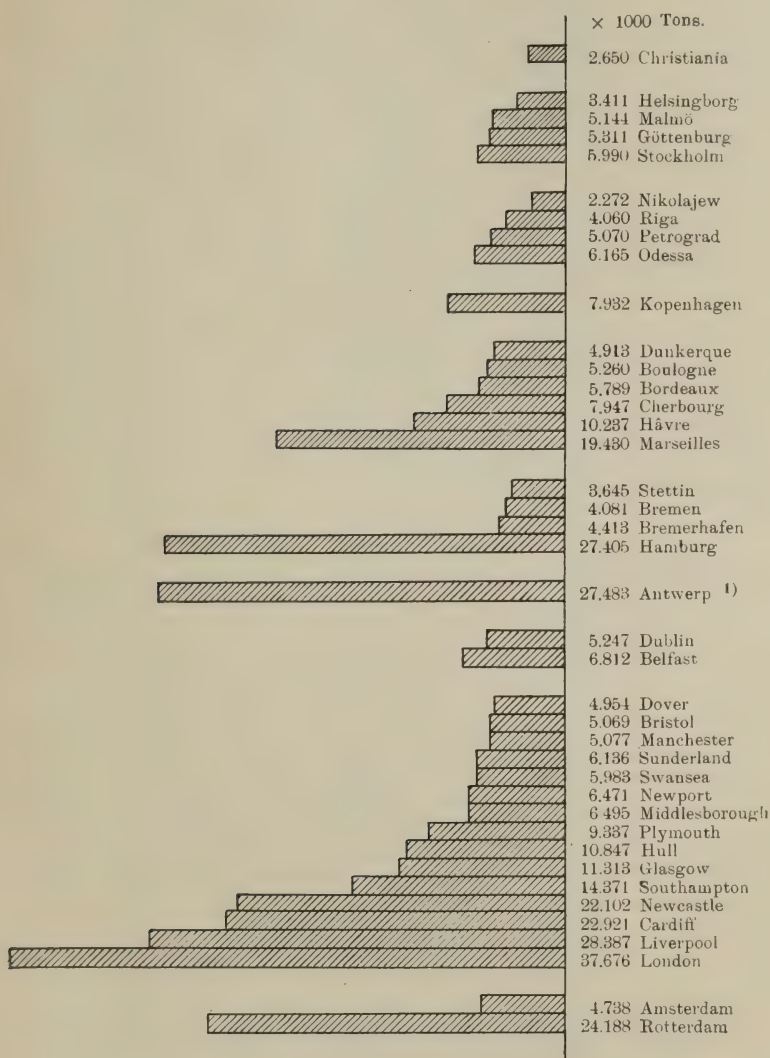
* Royal Packet Nav. Co. and Java-China-Japan-Line, having their nominal Head office in Amsterdam, though their fleets operate in the East only.

The first steamship Companies.

The first company to start liners under the Netherlands flag was the "*Batavier*" Line from Rotterdam to London (1823), which still exists. Next came, in 1856, the *Koninklijke Nederlandsche Stoomboot Maatschappij* (or Royal Netherlands Steamship Co.) of Amsterdam, for the Baltic, Spanish and Mediterranean trades — still one of Holland's principal owneries.

But it was not until 1870 that, following upon the improvement of the ports of Amsterdam and Rotterdam, and the opening of the Suez Canal, a more considerable development

Europe's Principal Ports: Annual shipping compared.



¹⁾ Owing to a different system of registration prevailing in Antwerp, this figure is subject to a reduction of about 16 per cent for purposes of comparison with the other ports.

of the Netherlands steamship fleet began. That year saw the birth of two companies which have ever since remained in the van of Netherlands shipping enterprise.

One was the *Holland-America Line*, of Rotterdam — so well known in the United States — and the other the “*Nederland*” *Steam Navigation Co.* of Amsterdam, which like her later rival, the *Rotterdam Lloyd*, established at Rotterdam in 1883, had the Netherlands East Indies, and more particularly Java, for its object.

The Holland-America Line (or, to give it its full name, the *Nederlandsch Amerikaansche Stoomvaart Maatschappij*, hence also called N A S M) had a modest beginning: its fleet consisted originally of two steamers, with which a regular service to New York was started. To-day the Company has spread a network of such services all over the Atlantic — to all parts of the States, to Canada, Mexico, and Cuba, while a new line through the Panama Canal to San Francisco, is about to be established.

Netherlands East Indies and Panama Canal.

The opening of the Panama Canal means, in many respects, the opening of the Pacific, and of all countries situated in or around it. A glance at the map will suffice to make one apprehend the immense possibilities of new trade routes, new connections and new markets across this wide ocean. The Netherlands East Indies, with their teeming millions, untold riches and wealth of soil, are bound to play an important part in the future of the Pacific, and the position of Netherlands shipping in those waters may, therefore, be of interest to the American reader.

Netherlands Flag in the East.

The “Nederland” Company and the Rotterdam Lloyd form the visible link binding the Netherlands to their Eastern possessions. They maintain a regular weekly mail service — each Company providing a fortnightly sailing — by means of a magnificent fleet of



Port of Curacao with steamers of *Royal Dutch West India Mail Co.*

mail-steamers, in addition to which they employ a large number of fine and up to date cargo-vessels.

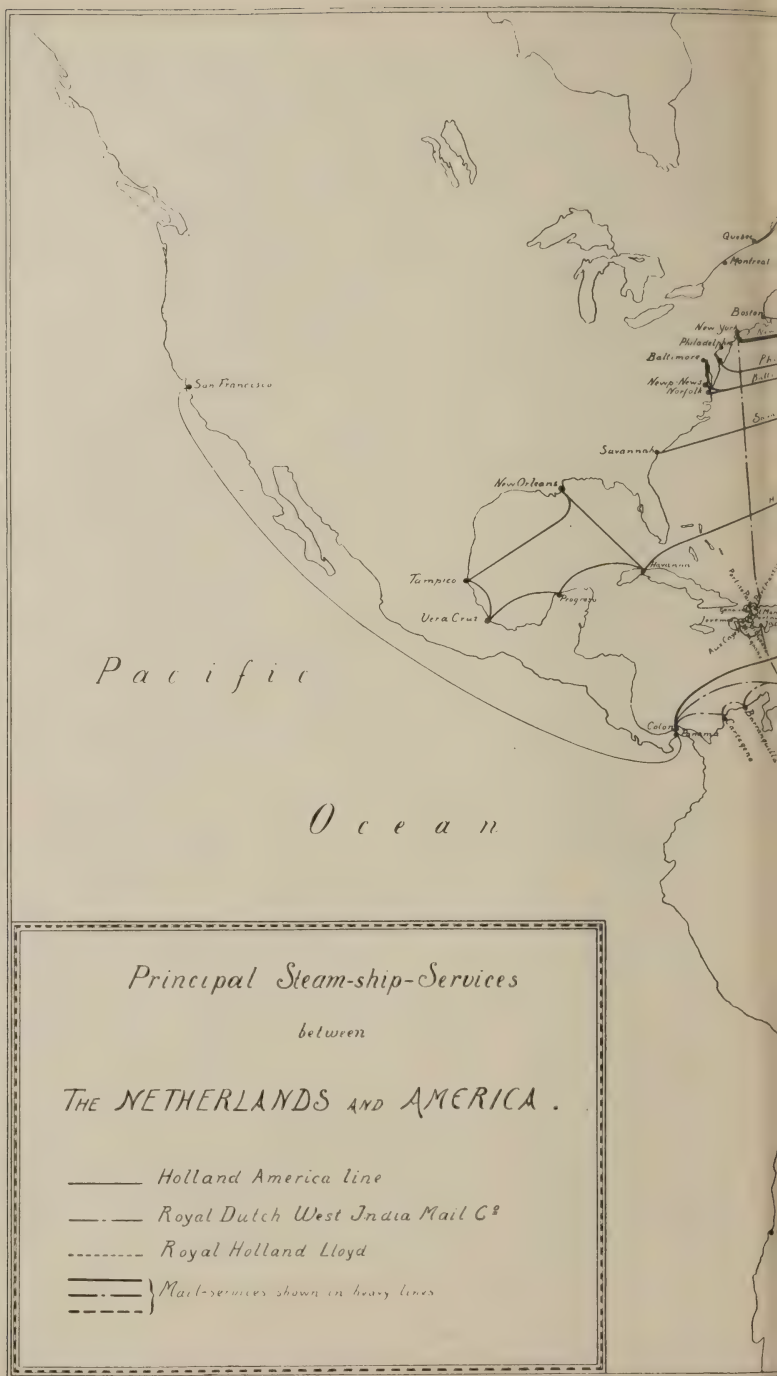
The two Companies have been instrumental in bringing about a remarkable revival of Netherlands shipping in the Far East during the last twenty five years — either under their own house-flags, or by establishing new companies and steamship-lines spreading out in all directions.

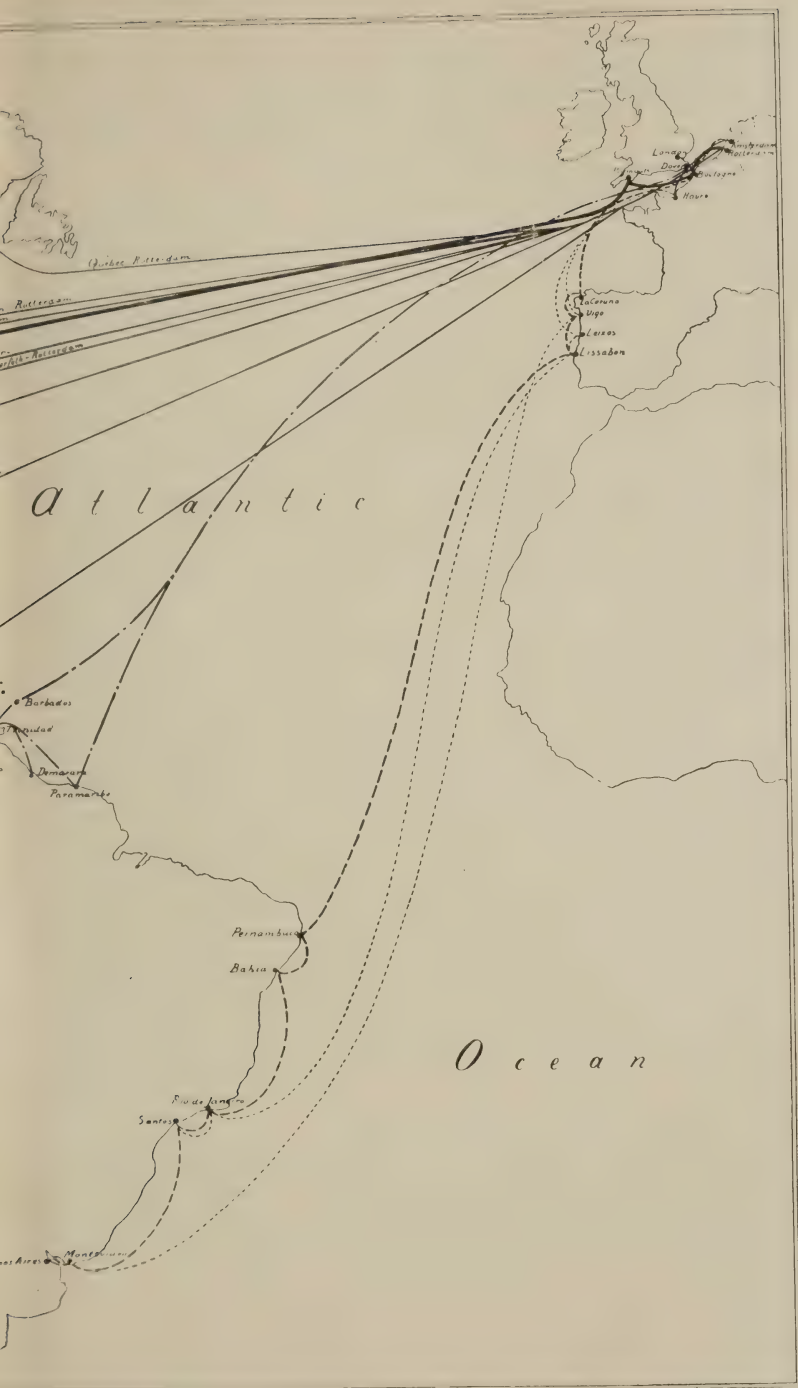
First and foremost, they founded the *Koninklijke Paketvaart Maatschappij* (or Royal Packet Navigation Company) in 1891, with the object of creating a system of regular services inter-connecting all the principal islands of the Netherlands East Indies and serving as feeders for the parent mail-lines. Eleven years later, the three Companies combined to found the *Java-China-Japan Line* to provide a regular connection between the Netherlands East Indies and the Far East. Again four years later, a cargo service was established from Java to Rangoon and Calcutta, under the name of *Java-Bengal Line*, while in 1908 the "Royal Packet" inaugurated a *Java-Australia Line* (for passengers and cargo), soon followed by a *Java-Siam Line*. More recently, the Rotterdam Lloyd and "Nederland" Lines have established a joint cargo service from Java to New-York via the Suez Canal, returning via the Cape of Good Hope.

Holland's Share in Suez Canal Traffic.

As an illustration of the important share borne by Netherlands shipping companies in the Eastern trade, the following figures may serve, showing the annual tonnage passing through the Suez Canal :

Nationality of Shipping	1910		1911		1912		1913	
	Number	Gross Tonnage	Number	Gross Tonnage	Number	Gross Tonnage	Number	Gross Tonnage
Total Traffic	4533	23,054,901	4969	25,417,853	5373	28,008,945	5085	27,737,180
Great Britain	2778	14,363,539	3089	16,104,574	3335	17,611,216	2951	16,537,505
Germany	635	3,620,026	667	3,924,639	698	4,241,001	778	4,694,350
Netherlands	259	1,196,233	284	1,357,143	343	1,718,071	342	1,786,747
France	240	1,249,704	232	1,252,933	221	1,193,181	256	1,401,543





It will be noticed that since 1911 the Netherlands flag has pushed the French flag from the third place, both as regards number and total tonnage of vessels.

West Indies and South America Trade. The oversea possessions restored to Holland in 1813 included not only those in the Eastern Archipelago but also some (not all) of those she formerly owned in the West, viz. Surinam or Netherlands Guyana, and a number of islands such as Curaçao, Saba, Bonaire, St. Eustatius, better known as the Netherlands West Indies. The opening of the Panama Canal will no doubt have a favorable effect on the future development of these colonies, and Curaçao especially is bound to become an even more important coaling and transshipping station than it already is, thanks to its admirable geographical situation and natural advantages. Important harbor improvements are being carried out by the Government in anticipation of this increase of trade.

In order to bring these valuable colonies into closer contact with the Mother Country, the *Koninklijke West-Indische Maildienst* (Royal Dutch West India Mail Company) was established in 1882. The Company maintains a regular service between Amsterdam, Paramaribo and Curaçao via other West Indian ports and New York, while a new service to Colon will be opened in the course of this year (1915).

Another Company, named *South-America Line* was founded at Amsterdam in 1900, and commenced a monthly cargo-service to Brazil and the Argentine. After a somewhat chequered career, this company was reconstructed in 1906 and renamed *Koninklijke Hollandsche Lloyd* (Royal Holland Lloyd) since when it has considerably enlarged and improved its fleet, and extended its passenger- and cargo-services.

Other Companies and Trades. The Companies mentioned so far are only some of the more important regular steamship lines established in the Netherlands during the last fifty years. There are, however, several others, such as the *Hollandsche*

Stoomboot Maatschappij (Holland Steamship Company) trading between Amsterdam and various English and Scottish ports, the "*Zeeland*" Line (daily mail- and passenger-service between Flushing and Queensboro'—London), and a number of smaller owneries trading regularly to British, French, German and Spanish ports.

Apart altogether from these regular lines, there is a considerable fleet of general cargo-carriers or "tramps", owned by some thirty different companies in Amsterdam and Rotterdam, particulars of which will be given later on, but which may be summarised as follows:—

Two of these owneries restrict themselves solely to the carriage of oil in bulk (tank-steamers) Two others carry only coal. Two other Companies, again, being interested in mines, employ vessels specially adapted for the carriage of ores. Another Company owns both colliers and ore-carriers. Five owneries are engaged in the American, European and Eastern trades. The remainder (18 owneries) are chiefly connected with the timber trade.

**Holland's
Mercantile
Fleet To-day.**

The growth of Holland's *steamship* fleet during the last fifty years is shown by the following figures:

	1860	1870	1880	1890	1900	1910	1914
Number of steamers.	34	60	108	164	224	347	709
Total Tonnage.	14,099	27,911	117,255	220,014	365,945	607,822	1,471,710

Comparing the increase in tonnage (*steam and sail*) under the Netherlands flag since 1900 with that of the world's tonnage for the same period, according to Lloyd's Register, we arrive at the following interesting result:

	1900	1914	Increase
World's Tonnage	29,044,000	49,090,000	69 %
Netherlands „	530,000	1,496,000	182 %

Relatively speaking, therefore, Holland has within the last fourteen years increased its mercantile fleet almost thrice as rapidly as the rest of the world.

**Merchant Marines
of all Nations
compared.**

If we want to compare Holland's mercantile marine with that of other nations we can do so absolutely and relatively. That is, we can compare the

tonnage of the fleets owned by the respective nations *as a whole* — but we can also compare the average tonnage owned *per head of population*. Both methods have been applied in the following table, which includes *sea-going* ships (steam and sail) over 100 tons only, and otherwise speaks for itself:

Nations	Total Tonnage owned 1914	Increase since 1900 Per Cent	Average Ton- nage per 1000 Head of Pop.	Relative Importance
1 Great Britain . .	21,045,049	47	342	2
2 Germany . . .	5,459,296	109	84	7
3 United States . .	2,970,284	46	32	10
4 Norway . . .	2,504,722	58	1047	1
5 France . . .	2,319,438	64	58	8
6 Japan . . .	1,708,386	197	32	10
7 Italy . . .	1,668,296	69	48	9
8 Netherlands . .	1,496,455	182	244	4
9 Sweden . . .	1,118,086	75	199	5
10 Austria . . .	1,055,719	154	20	11
11 Russia . . .	1,053,818	46	8	12
12 Greece . . .	836,868	241	185	6
13 Denmark . . .	820,181	58	295	3

It will be seen that, while Holland stands eighth on the list according to total tonnage, it attains the fourth place in average tonnage owned per 1000 head of population.

**A Hundred Million
Dollars Afloat.**

Although it would be extremely difficult to express in exact figures the aggregate value of Holland's shipping interests, some idea of it may be formed

from the fact that the capital invested in Netherlands shipping companies is estimated to-day at no less than one hundred million dollars — surely a magnificent property

to own for a small country like the Netherlands. Yet this only represents the capital *directly* invested in the shipping business. In addition, there are vast capitals employed in undertakings closely connected with it — such as shipbuilding yards, docks and repairing yards etc.

**Shipbuilding in
the Netherlands.**

Out of 806 vessels constituting the Netherlands sea-going mercantile marine today, about two thirds have been built at home, the remainder having been constructed abroad (chiefly in the United Kingdom). The fact that so many vessels have been ordered abroad in the past does not by any means imply that the Netherlands yards — which enjoy no protection whatever either by legislation or customs tariffs — cannot compete with the British. On the contrary, it is a well known and admitted fact that there are no better ships built anywhere than in the Netherlands, and at no higher cost than elsewhere. The truth is, that the building capacity of the Netherlands yards has fallen seriously behind the requirements of the national shipping companies, whose continued prosperity during the last decade led to an unprecedented expansion of their fleets, and forced them to go abroad for the tonnage which the Netherlands yards could not supply. There is no doubt, however, but that the shipbuilding industry in the Netherlands will soon adapt itself to this increased demand, and on all sides the yards are being extended or new yards established.

**Oversea Towage :
A Netherlands
Speciality.**

Among the many and varied maritime activities of the Netherlanders there is one in which they unquestionably hold the palm. This is oversea towage — not, as it may appear at first sight, a very important branch of the shipping business, yet one requiring exceptional skill and seamanship. There is probably no other country where the art of towing has become such a necessary part of shipping as in Holland, with its numerous rivers and navigable canals. Yet this kind of towage is mere child's play compared

to oversea towage, which nearly always means towage, not of ordinary ships, but of dredges, floating docks and other equally unmanageable craft. The first job of this kind ever undertaken was the towage of a bucket-dredge from Holland to the Kaiser Wilhelm Canal, Germany. And a risky job it was considered, too. Today there are four companies in Holland who make oversea towage their special business, and who think nothing of towing docks, dredges, or any other floating object, however cumbrous and awkward its shape — from Holland to Java, Buenos Ayres, Chili, Durban, China — or any other part of the globe.



A 14000 ton floating dock on its way from Amsterdam to Java.

NETHERLANDS STEAMSHIP OWNERSIES.

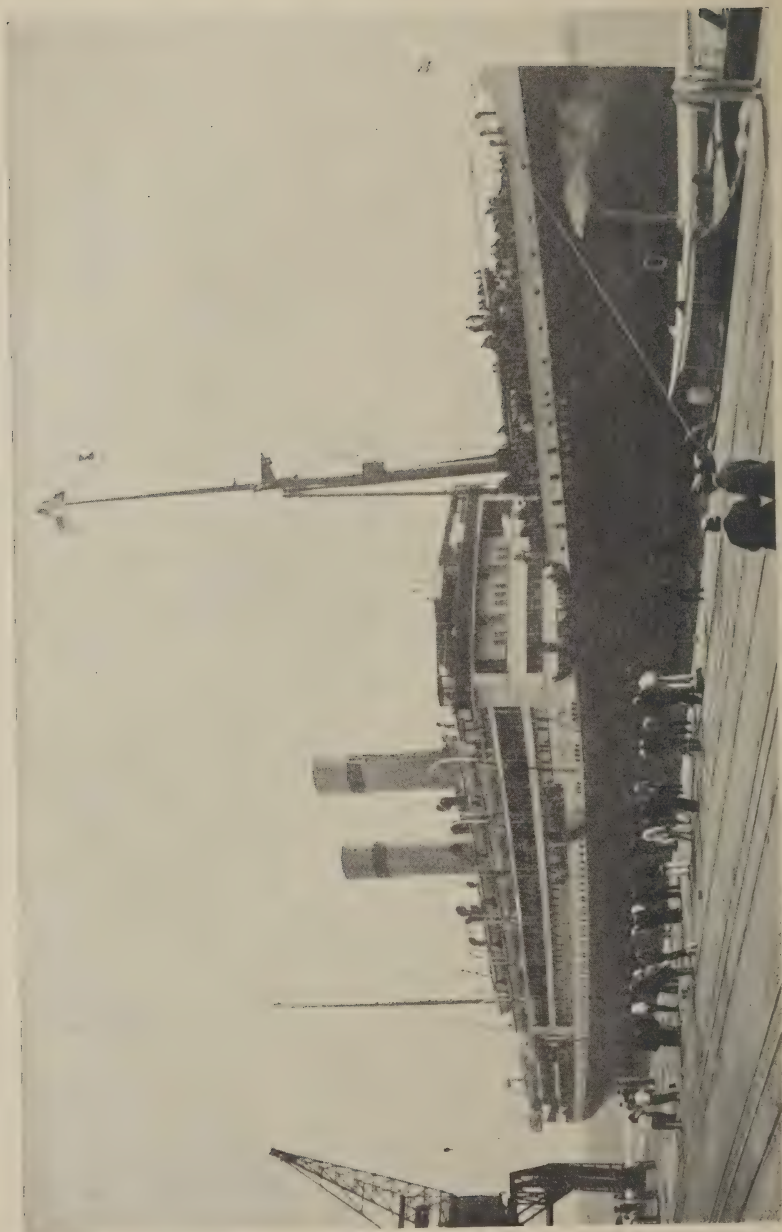
(As on 1st. Jan'y 1915).

A. REGULAR LINES.

	Name of ownery.	Number of ships.	Gross Tonnage.	
			In commiss.	Building.
1	Holland America Line . . .	21 + 4	207.678	40.000
2	"Nederland" S. N. Co. . . .	35 + 3	213.445	24.400
3	Rotterdam Lloyd	29 + 3	164.985	23.660
4	Royal Packet Nav. Co. . . .	87 + 7	148.054	19.900
5	Royal Netherl. Steamship Co.	50	132.400	—
	Royal Dutch West India Mail	10 + 3	26.212	16.500
6	Royal Holland Lloyd	14	91.239	—
7	Java-China-Japan Line . . .	9 + 1	45.174	8.000
8	"Zeeland" S. N. Co.	7	16.242	—
9	"Ocean" S. N. Co.	5	22.902	—
10	Holland Steamship Co. . . .	11	16.452	—
11	Wm. H. Müller & Co's Batavier Line and General Ship- ping Co.	8	10.354	—
12	P. A. van Es & Co.	3 + 1	2.423	900
13	Holland Shipping Co. . . .	2	1.857	—
14	Rotterdam—London S. N. Co.	1	847	—
15	Smith & Co. Ltd.	1	759	—
16	Shipping and Coal Co. . . .	1	682	—
17	Havre Steamship Co. . . .	1	642	—
18	Netherl. Cargo Shipping Co.	1	634	—
19	Groningen-Rotterdam S.N. Co.	1	284	—
20	Overijssel-English S. N. Co. .	1	200	—
21	Singkep Tin Co.	1	179	—
Total		299 + 22	1.103.645	133.360

B. GENERAL SHIPPING.

	Name of ownery.	Number of ships.	Gross Tonnage.	
			In commiss.	Building.
1	Neth. Indian Tank S.S. Co. . .	26	43 613	—
2	American Petroleum Co. . . .	8	27 070	—
3	Furness' Shipping Co.	14	46.555	—
4	Van Nievelt, Goudriaan & Co.	10 + 5	27.536	17.750
5	{Shipping and Coal Co.}	13 + 4	21.063	4.750
	{Netherlands Lloyd}			
6	"Triton" S. N. Co.	8	24.932	—
7	"Oostzee" S. N. Co.	10 + 1	17.772	3.000
8	Wm. H. Muller & Co.	3	17.129	—
9	Phs. van Ommeren	8 + 1	17.544	3.500
10	Jos. de Poorter	5	7.280	—
11	Solleveld, van der Meer & van Hattum	8 + 2	14.065	7.000
12	"Bothnia" S. N. Co.	4	10.878	—
13	Erhardt & Dekkers	6	13.577	—
14	"Zeevaart" Company	3	10.340	—
15	"Tromp" S. N. Co.	4	8.451	—
16	Van Uden Bros.	3 + 2	7.777	7.000
17	A. C. Lensen.	5	9.915	—
18	"Sophie H" S. N. Co.	1	2.930	—
19	P. W. Louwman	1	2.045	—
20	Timber Shipping Co	4	5.038	—
21	Hudig & Pieterse	1	—	1.200
22	W. H. Berghuys	3	3.223	—
23	Oversea Cargo Shipping Co. .	2	800	—
24	Karl Schroers	1	1.870	—
25	Sea and River S.S. Co. . . .	1	1.779	—
26	"Vulcan" Co.	2	2.770	—
27	General Steam Nav. Co. (Wambersie & Son)	2 + 1	6.600	3.300
28	Northern Netherl. S.S. Co. .	1	1 036	—
29	"Rensiena" S.S. Co.	1	236	—
30	"Gerrittina" S. S. Co.	1	150	—
Total		158 + 17	353.974	47.500
Grand Total		457 + 39	1.457.619	180.860
		496	1.638.479	33



s.s. "Tubantia" (*Royal Holland Lloyd*) lying at the wharf, Rio de Janeiro.

III. PRINCIPAL NETHERLANDS SHIPPING COMPANIES.

**Holland-America
Line
Rotterdam.** Established 1870/72.
Weekly mail- and passenger-service
between Rotterdam and New-York,
calling at Boulogne s/Mer both ways,
and also at Plymouth on the homeward voyage. (During the
war, both ports of call are omitted).

In addition to this mail-service the company maintains
a number of regular cargo-services between Holland and
New-York, Boston, Philadelphia, Baltimore, New-port News
and Norfolk, Savannah, Charleston, Cuba, Mexico, New
Orleans, Quebec and Montreal.

NEW SERVICE TO SAN FRANCISCO.

A new service will be opened in the course of this year from
Rotterdam to San Francisco, Portland, Seattle and Vancou-
ver, through the Panama Canal. The vessels to be employed
in this service will have special accommodation for
emigrants.

The Company's fleet consists at present of

6 mail steamers aggregating	113.378 tons.
15 cargo " "	94.300 "

Included amongst the former are the giants "Rotterdam"
(24.000 tons, built in 1908) and "Statendam" (32.500 tons,
built in 1915) which rank with the largest and most palatial
vessels in the world. In addition to the above, there are
building two passenger-steamers of 12.000 tons each for the
new San Francisco service, and two cargo-vessels of 8.000
tons each.

**"Nederland"
S. N. Company
Amsterdam.** Established 1870.
Fortnightly mail- and passenger-ser-
vice between Amsterdam and Java
through the Suez Canal, via Southamp-
ton, Lisbon, Tangier, Algiers, Genoa, Port Said, Suez, Co-
lombo, Sabang (Sumatra) and Singapore. Also frequent cargo-
services from Hamburg, Amsterdam, Antwerp and other

continental ports, to the Dutch East Indies, and vice versa.

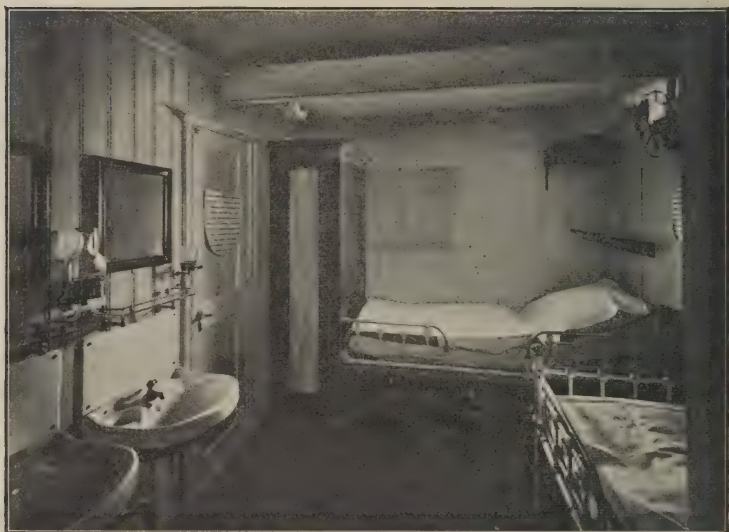
The Company's fleet (in commission and building) consists of

9 mail steamers aggregating	67.977 tons.
29 cargo " "	169.868 "

Established 1883.

Rotterdam Lloyd
Rotterdam.

Fortnightly mail and passenger-service between Rotterdam and Java, via Southampton (homeward only), Lisbon, Tangier, Marseilles, Naples, Port Said, Suez, Colombo and Padang (Sumatra). The Rotterdam Lloyd and "Nederland" lines have arranged alternate sailings, thus providing a regular weekly service, under contract with the Netherlands Government, whose mails and passengers they carry.



First Class Cabin, s.s. "Insulinde" (*Rotterdam Lloyd*).

The Company also maintains various cargo-services to and from Java and other parts of the Dutch East Indies.

Its fleet (including one mail- and two cargo-steamers building)
consists of:

10 mail steamers aggregating	60.602 tons.
22 cargo " "	128.043 "



Music Saloon, s.s. "Prins der Nederlanden" (*Nederland* Line).

**Java-New-York
and Java-Bengal
Joint Services.**

The Rotterdam Lloyd and the "Nederland" line have recently started a direct cargo service from Java and Macassar (Celebes) to New York via the Suez

Canal and Genoa or Marseilles, returning to Java via South Africa. Sailings will be monthly for the present. This service will no doubt assist considerably in developing trade between the United States and Holland's Eastern possessions.

Another, three-weekly cargo service, maintained conjointly by the same two companies, has existed for some years past between Java, Rangoon and Calcutta, and succeeded in building up a considerable trade between British and Netherlands India.

Royal Packet Navigation Company (Koninklijke Paketvaart Maatschappij) **Amsterdam-Batavia.** Established 1891. Though having its nominal seat and Board of Directors at Amsterdam, this Company restricts itself solely to the shipping trade in and around the Netherlands East Indies, where it has its head-quarters at Batavia. With its fleet of nearly 100 vessels, the Royal Packet Company (not to be confounded with its British namesake, the Royal Mail Steam Packet Co.) is undoubtedly one of the most important shipping companies in Eastern waters. It maintains some fifty regular mail-, passenger- and cargo-services throughout the Netherlands East Indies (partly under contract with the Government), thereby interconnecting nearly three hundred ports and islands. The enormous importance of these services for the government and economical development of the Archipelago may be gauged from the fact that the mileage covered by the Company's steamers during 1913 was 2,534,832 miles (being 117 times the circumference of the earth), while the cargo and the number of passengers carried amounted to 1,861,468 tons and 663,378 passengers, respectively.

Of all Dutch shipping companies, there is none showing such a remarkable record of progress as this one, which trebled its fleet, and increased its business nearly eightfold in less than 25 years.

The following figures may serve to illustrate this:

Year.	Number of Vessels.	Gross Tonnage.	Cargo carried.	Passengers carried	Mileage.
1891	27	28,637	221,522	119,336	752,448
1913	96	164,529	1,868,468	663,378	2,534,832
Increase per cent.	255 %	475 %	743 %	456 %	237 %

Incidentally, these figures also illustrate the wonderful economical progress of the Netherlands East Indies during

the last twenty five years, due to the strenuous development policy pursued by the Netherlands Government.

The Royal Packet Company's fleet is at present composed of the following:

63 mail- and passenger-steamers aggreg : 123.522 tons.

3 do. motor ships " 5.674 "

29 cargo-steamers and motor ships " 25.958 "

In addition to its numerous inter-island services, the Royal Packet Company has, within the last few years, created regular lines between Java and Australia, via Torres Straits, and between Java and Bangkok (Siam).

The *Java-Australia Line*, established in 1908, has proved



53

s.s. "Houtman." (*Java-Australia Line*).

a valuable link in the chain of steamship lines connecting Java with the rest of the world, and especially with her neighbors in the Pacific. It has acted as a powerful lever in developing trade and passenger traffic between Australia and the Netherlands East Indies, and, with Java's growing popularity as a tourist resort, there is no doubt a great future before this Line.

The new steamers "Tasman" and "Houtman", sisterships of 5,000 tons each, which were recently placed in the Company's Australian service, are magnificent vessels and by far the largest and fastest on this route. The regular ports of call are, after Java: Macassar, Port Darwin, Thursday Island, Brisbane, Sydney and Melbourne.

Special "Round the Pacific" tours have been arranged between this Line and the various transpacific Lines, enabling tourists to travel at reduced rates from San Francisco or Vancouver to Sydney, thence to Java, Hongkong, Japan, and back to starting point.



Dining saloon s.s. "Tasman" (*Java-Australia Line*).

Netherlands Shipping Union.

In order to promote harmonious working in the common interest, the three last named companies, "Nederland," Rotterdam Lloyd and Royal Packet Company have formed a combine known as the Netherlands Shipping Union (*Nederlandsche Scheepvaart Unie*). Its more immediate object is to issue its own shares in lieu of

those of the respective Companies, who, however, retain their individual management and organisation.

The Union represents therefore a combined fleet of 164 vessels aggregating 594.444 tons gross.



Smoking saloon s.s. "Tasman" (*Java-Australia Line*).

**Royal Netherlands
Steamship Company
Amsterdam.**

Established 1856.

This Company maintains the following regular cargo services from Amsterdam: —

Twice weekly to Hamburg;

Weekly to Copenhagen, Dantzig, Königsberg, Stettin and Petrograd (St. Petersburg);

Fortnightly to Bordeaux;

Weekly to Portugal and Spain (Lisbon, Gibraltar, Malaga, Cartagena, Alicante, Barcelona, Tarragona and Valencia);

Weekly to Italy (Genoa, Savona, Leghorn, Naples, Catania, Messina and Palermo);

Fortnightly to Alexandria (Egypt);

d^o to Smyrna via Malta, Patras and Pyraeus (Athens);

Fortnightly to Odessa, via Algiers, Salonica, Constantinople, Bourgas and Varna.

Several of these services have of course been temporarily suspended owing to the war.

The Company's fleet consists of 50 steamers, aggregating 132.400 tons gross.

**Royal Netherlands
West India Mail
Amsterdam.**

Established 1882.

Since 1912, this Company has been amalgamated with the Royal Netherlands Steamship Company, although it has retained its name and separate management. As the name implies, the company operates in the Netherlands West Indies, and maintains a fortnightly mail-, passenger- and cargo-service (under contract with the Netherlands Government) from Amsterdam to Paramaribo (Surinam) and thence to New-York via Demarara, Trinidad, Carupano, Cumana, Guanta, La Guayra, Puerto Cabello, Curaçao, Jachmel-aux-Cayes, Jeremie, Petit Goave, Port au Prince, St. Marc and Gonalves. The return voyage follows the same route, with Havre as an additional port of call.

NEW SERVICE TO COLON.

In view of the opening of the Panama Canal, the Company will shortly establish a new threeweekly mail-, passenger- and cargo-service from Amsterdam to Colon calling at Barbados, Trinidad, La Guaira, Curaçao, Puerto Colombia, and Cartagena. On the return voyage Barbados is omitted, while additional calls are made at Puerto Cabello and Havre. For this service three splendid new steamers of 5.500 tons each have been built, named "Venezuela," "Colombia" and "Ecuador."

Including these new vessels, the Company now owns 13 steamers aggregating 42.712 tons gross.

**Royal Holland
Lloyd.
Amsterdam.**

Established in 1900 as „*South-America Line*"; — reconstructed in 1908 under its present name.

The Company maintains the following regular services, under contract with the Netherlands Government: —

1. *Fortnightly mail-service* from Amsterdam via Dover, Boulogne s/Mer, La Coruna, Vigo and Lisbon to Rio de Janeiro, Santos, Montevideo and Buenos Ayres;



Social Saloon, s.s. "Gelria" (*Royal Holland Lloyd*).

2. *Cargo-service* via Leixoes and Lisbon to Pernambuco, Bahia, Rio de Janeiro and Santos;

3. *Cargo-service* via Vigo to Montevideo and Buenos Ayres, with transhipment for Rosario.

In spite of its comparatively short existence, and keen opposition of rival companies of various nationalities, the company has acquired an important place in the South-American trade, and its mail-steamers, especially the two latest ones ("Gelria" and "Tubantia") have gained a magnificent reputation for their splendour, luxury and exceptional comfort. They compare favorably with any other steamers trading on this route and are favored alike by the wealthy traveller and the modest third class passenger.

The Company's fleet consists today of
 5 mail-steamers aggregating 51.295 tons.
 9 cargo- " " 39.944 "

Java-China-Japan Established 1902.

Line.

**Amsterdam-
Hongkong.**

This Company reflects in its remarkable progress, the general prosperity and commercial activity of the Far East of the last decade. From three modest steamers of 3.800 tons each, the Company's fleet has grown in these few years to ten vessels, aggregating 53.400 tons gross, by means of which the following regular services are maintained : —

1. *Java-Japan Line*: From Batavia via Cheribon, Samarang, Sourabaya and Macassar to Hongkong, Yokohama, Kobe and Moji, returning to Java via Hongkong.

2. *Java-China Line*: From Sourabaya via Samarang, Cheribon and Batavia to Hongkong, Swatow, Amoy and Shanghai, returning to Java via Amoy, Swatow and Hongkong.

3. *Java-Saigon Line*: From Java to Saigon and vice versa.

The steamers of this Company, though primarily intended for cargo, have limited but excellent accomodation for passengers.

**Holland Steamship
Company.
Amsterdam.**

Established 1885.

Regular services between Amsterdam and London, Hull and Scotland, also to Plymouth, Bristol and Fowey. The Fleet consists of eleven steamers, aggregating 16.452 tons gross.

**Wm. H. Müller & Co.
Rotterdam.**

This well known firm occupies a somewhat unique position amongst Netherlands shipowners, in as much as it combines its shipping business with an extensive, almost worldwide, general trade, more especially in ores and minerals, cereals, wool, timber, etc. The firm has

its own branch offices in all the more important trade centres of Western Europe, Russia, Egypt and the Mediterranean, Turkey, Rumania and South America.

Messrs. MÜLLER & Co.'s shipping department comprises the *Batavier Line* (daily passenger- and cargo service between Rotterdam and London) with four steamers of about 1.500 tons each; also regular cargo services to Hamburg, Aberdeen, Middlesbro', Bilbao, Santander and Passages; while special ore-ships are employed in connection with the firm's mining interests in Sweden, Spain and Russia. Altogether, eleven steamers aggregating 27.483 tons are employed in these trades.

**Netherlands Indian
Tanks S.S. Co.**

As the name implies, this company restricts itself solely to the carrying of oil and oil-products in tanksteamers in connection with the Royal Dutch Oil

Company's business.

**American Petroleum
Company.**

Closely connected with the Standard Oil Company of N. Y. whose continental business it partly conducts, by means of a fleet of 9 tanksteamers.

**Furness' Shipping
and Agency Co.
Rotterdam.**

Cargo services to India and the Far East, also South and North America. This company was only established in 1911 but has been rapidly extending its

fleet which now consists of 14 steamers aggregating 46.555 tons gross.

**Van Nievelt,
Goudriaan & Co.
Rotterdam.**

Established 1905. The company owns 10 steamers while 5 more are building, upon completion of which the aggregate gross tonnage will amount to

45.286 tons. During the summer months, this fleet is chiefly engaged in the Baltic and White Sea timber trades, while during the remainder of the year employment is found in the American, Eastern and Mediterranean trades.

**Shipping
and Coal Co.
Rotterdam.**

This Company, working in conjunction with the Netherlands Lloyd Co., owns a fleet of 13 colliers and cargo-vessels, in addition to which there are 4 building. Apart from a weekly cargo service between Harlingen (Friesland) and Goole, practically the whole of the Company's business is connected with the English and continental coal trade. Several of its steamers also carry timber from the Baltic.

**Zeeland S. N. Co.
Flushing.**

Established 1875.
Daily mail- and passenger-services under contract with the Netherlands Government between Flushing and London via Folkestone and Queensboro', in conjunction with the South Eastern and Chatham Railway Co., and with the Netherlands State Railways. The steamers employed in these services count amongst the finest crossing the English Channel, and have excellent railway connection from Flushing to all parts of the Continent.

PORTS AND WATERWAYS IN THE
NETHERLANDS BY V. J. P. DE BLOCQ VAN
KUFFELER, ENGINEER IN THE ROYAL "WATERSTAAT" CORPS.

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PORTS AND WATERWAYS IN THE NETHERLANDS

BY V. J. P. DE BLOCQ VAN KUFFELER, ENGINEER IN THE ROYAL "WATERSTAAT" CORPS.

INTRODUCTION.

IN the Netherlands, trade and shipping constitute about the most important sources of national prosperity. For a small country with an area of only 33000 square km. (12680 square miles), they are indeed considerable. At present the import, in normal times, amounts to about 50 million tons a year, of which only $17\frac{1}{2}$ per cent. is transported by land. The export amounts to 40 million tons a year, of which only 13 per cent. is conveyed by land. These figures clearly demonstrate how important a place shipping occupies in the Netherlands both as regards ocean-traffic and inland shipping.

Not only the ocean-traffic, which comprises 45 per cent. and 20 per cent. of import and export respectively, but the inland shipping also, which has to carry 18 of the 20 million tons, annually exported to Germany, are of the greatest importance for the economic development of the country.

Though of course the railways play an important part, and automobilism has largely contributed to the revived importance of the highways, — in a land, intersected by a network of excellent waterways these waterways form the chief means for transporting goods, especially bulkgoods. To illustrate this, it is sufficient to mention that the total goods traffic on the Netherlands railways in 1913 amounted to 20 million tons, while on the Upper Rhine alone, in both directions together, the shipping concerning the Netherlands amounted to 28 million tons. Taking into consideration the extensive network of waterways existing in the Netherlands

besides the Rhine, these figures show the importance of the water-traffic, and the special conditions prevailing in our country in this respect.

This becomes especially marked when considering the great advantages, owing to the lower charges, which the waterways offer for the conveyance of heavy goods. Wherever the development of agriculture or industry leads to a more considerable traffic, we inevitably observe that every effort is made to procure good waterways. In the industrial regions of Westphalia and the Rhine provinces, the Dortmund-Ems Canal and the Rhine-Weser Canal were made; Berlin is connected with the agricultural regions in the east of Prussia by a network of canals. Present circumstances in Germany emphasize the necessity of building the Mitland Canal which, in the north of the country, is to join the west with the east. In southern Germany the Neckar and Main are being improved, in order to obtain a connection with the Rhine; Austria is planning an extensive canal-system; France has one already, but on too small a scale, so that the need of improvement is making itself strongly felt; North-America made canals connecting the big lakes and is now constructing the Ship-Barge Canal, which is to facilitate the conveyance of grain from the Lake districts to the North-Eastern part of the United States.

Good waterways being aimed at all over the world, a country like ours, which is provided with them by nature is especially favored. Doubtlessly it is mainly owing to this fact that the Netherlands occupy such an important place in the world's traffic. Her two largest ports, Amsterdam and Rotterdam may indeed in many respects be considered as important centres of the world's traffic. As far as import is concerned, Rotterdam is the second port of the European continent, and the fourth of all Europe, and if the English coasting trade is left out of consideration, it is even the third port of Europe. In the following table a survey of the clearings made in some of the European ports in 1913 is given:

Hamburg	14.185.000	tons nett.
Bremen	4.508.579	" "
Emden	1.486.997	" "
Amsterdam	3.170.936	" "
Rotterdam	12.785.861	" "
Antwerp	12.024.796	" "
Hâvre	3.746.214	" "
Marseilles	10.509.084	" "
London	20.088.071 ¹⁾	" "
Liverpool	15.574.989 ¹⁾	" "

Not only of late, but in olden times already, the Netherlands played an important part in the world's traffic, thanks to their highly developed navigation, resulting from the natural conditions of the land. The country is bounded on the north and west by the North Sea, which with numerous estuaries enters far into the land, whereas the Zuyderzee, connected with the North Sea in various places, penetrates right into the heart of the country. Considering, moreover, that the country chiefly consists of lowland, and is intersected by numerous waters, whilst the three main rivers, the Rhine, the Maas and the Scheldt, flow out into the sea, it is only natural that from the oldest times the Netherlands practised navigation, and that, especially as a seafaring nation, they soon attained a high development. Many were the voyages of exploration the Netherlands undertook in former days, many the colonies they founded and the commercial relations they established in several parts of the globe. Our colonies in East and West India and at the Cape of Good Hope have, ever since the middle-ages, largely influenced the economic and social development of our country, and our merchants managed to establish emporiums of great importance for the trade in colonial products. Besides this, the colonial possessions, as well as trade and shipping, brought in an immense profit, so that for those times huge fortunes were acquired. All this of course strongly influenced the position the Netherlands then occupied in the world. If the nature of the land in a large measure contributed to the

¹⁾ Coasting trade included.

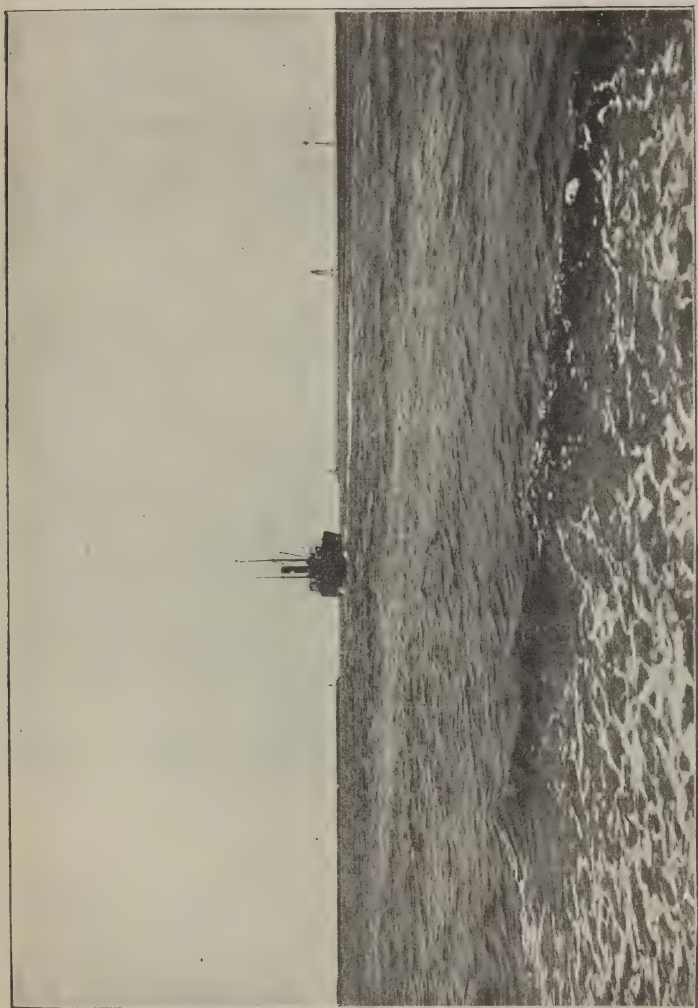
development of shipping in this country, the geographical situation also greatly helped to promote it. Our country is situated in the centre of North Western Europe; it is easily accessible by sea on all sides, and mighty rivers connect it with countries far from the coast.

In modern times there is moreover the gigantic development of the mining- and iron-industry in Westphalia and the Rhineprovince, which regions, for import and export, mainly have to rely on the Rhine, so that the traffic in our ports and along our waterways has increased considerably. Another factor is the growing prosperity of the British industries across the North Sea, which led to the forming of closer commercial relations and an increase of traffic. The Netherlands form as it were a link between the two great industrial powers of Europe, viz. between England and Germany.

In our own country, the economic life increased with that of others, everywhere in our harbors and waterways we see a steady growth of traffic, though for the present the war has put a stop to it.

As in nearly all branches, modern development presents a strong tendency towards concentration of traffic. Continually, bigger vessels are being constructed in order to reduce the expenses per ton; this, however, caused the dimensions of the ports and of the navigable channels leading to them to be increased. This demanded exceedingly expensive improvements, which again cannot be made to pay unless they really serve an extensive traffic. Big expensive ships should have as little delay as possible in the harbors; only those ports will be able to compete in the world's traffic, that are provided with a first-class harbor-plant, fitted out with the most modern appliances for the loading, transshipping and discharging of the various goods, and especially of the locally prominent bulkgoods.

For all these reasons, the small ports generally do not meet the requirements of modern shipping, in consequence of which they are reduced to a limited function, whilst traffic is becoming more and more concentrated into a few large continually expanding ports. These to an ever increasing



Outer Harbor Ymuiden.

extent attract trade, as they offer more chance of finding a cargo of some sort or other.

It is in keeping with the line of development of traffic, that, where at one time our country possessed many ports of comparative importance, now only known to tourists as the picturesque dead cities, e.g. on the Zuyderzee, the more important traffic in the Netherlands has been concentrated into two ports, Amsterdam and Rotterdam, to which we will give our attention first.

For the full development of a port it is not only necessary that the harbor itself is in a good condition, that it offers ample space for mooring, and has a good harbor-plant, it must be easily accessible from the sea, and connected with the interior in such a way as to enable a regular traffic at low cost and without hampering delays.

In describing the ports of Amsterdam and Rotterdam, their channels of access to the sea will therefore be dealt with first; then their communications with the interior will be described.

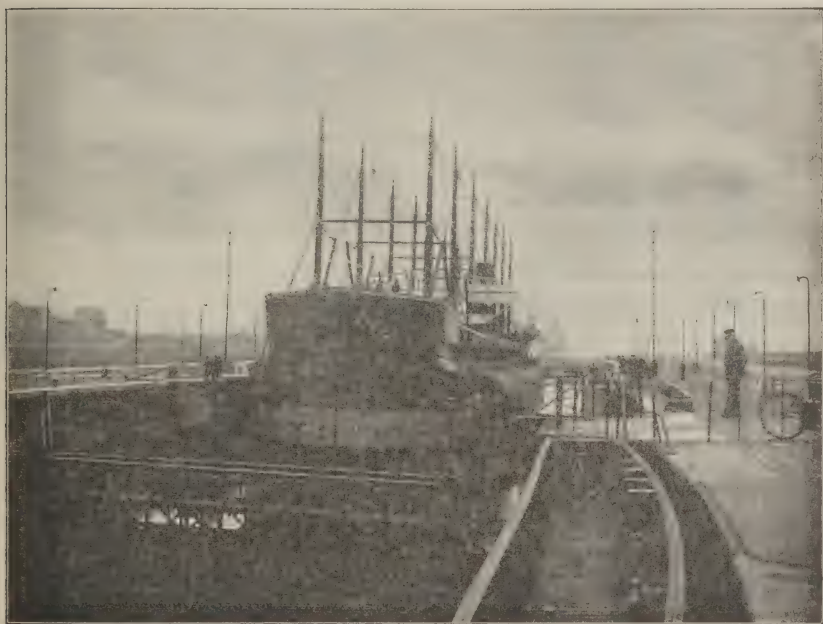
THE PORT OF AMSTERDAM AND THE NORTH SEA CANAL.

From early times Amsterdam has occupied an important place in commerce, more especially with the colonies. The vessels moored in the harbors opening out on to the Y, which was in open communication with the Zuyderzee. The Zuyderzee being shallow, and a sandbank, the so-called Pampus, at the mouth of the Y, caused the continually larger vessels, generally arriving via den Helder through the Texel-strait, the greatest difficulty in gaining the port. They had to be lightened for the purpose.

When, after the French domination, a new period of economic prosperity began, King William I recognised that a complete alteration of the port was necessary for the development of the capital. He caused a canal to be built from Amsterdam via Alkmaar, to the port of den Helder, situated on the Texel-strait. This canal, the Great North-Holland Canal (Groot Noord-Hollandsch Kanaal,) constructed between 1819 and 1825 costs f 11,000,000 (\$ 4,400,000), and

was, at the time of its completion, the biggest canal in the world, being navigable for ships measuring: 64 M. length, 14 M. wide and 5 M draught (210, 46 and 16,5 feet). The remarkably quick development in the dimensions of Ocean-going vessels soon rendered the new canal inadequate for shipping requirements, so that new measures had to be taken.

After due consideration the construction of a new canal



The S. S. "Grangesberg" with a Cargo of Iron ore in the great Lock at Ymuiden.

was resolved upon, the North Sea Canal, that was to lead from Amsterdam straight to the North Sea. The works were started in 1865 and on the first of November 1876 King William III inaugurated the canal, which however did not reach its final dimensions till the end of 1882. Originally, the construction and the management of the canal were entrusted to a private undertaking, the Amsterdam Canal Company,



View in the

the shares of which were almost entirely in English hands. Consequently the superintendence and execution of the work was mainly done by English engineers and contractors. They being unfamiliar with the peculiar difficulties any considerable work on our North Sea coast involves, met with many an adversity, especially when constructing the outer harbor of the canal, on the unprotected coast, where now Ymuiden lies. Financially these failures proved so severe that the Company had to apply to the government for support, with the result that on January 1st 1883 the canal was nationalized. The obstacles the Canal Company almost continually encountered, too great for a private company to cope with, undoubtedly were the main cause of the serious delay in the execution of the work. Among the important results of the nationalization of the canal was the abolition of canal dues on July 1st 1890.



Amsterdam.

Between 1887 and 1907 the canal underwent many changes. A new, large sea-lock was made at Ymuiden, and in the canal itself important improvements have been effected; by virtue of a law passed on July 24th 1899 the canal was made deeper, and the two railway-bridges over it were replaced by swing-bridges allowing a free passage of 180 feet, the two biggest swing-bridges in the world. The bridge for ordinary traffic at Velzen was replaced by a steam-ferry. In 1907, when all these improvements had been completed, the port of Amsterdam was once more accessible, through the largest ship-canal in the world.

The canal may be shortly described as follows. (In the "Short Description of the Amsterdam North-Sea-Canal", at the exhibition of the City of Amsterdam, a more detailed account may be found).

On the coast near Ymuiden, two moles have been

constructed, forming an outer harbor with an area of about 100 hectares (250 acres), to protect the outer canal leading from the deep sea to the locks, and measuring at high tide a depth of 11.5 M. (38 feet).

At present Ymuiden has three locks, the largest of which measures 225 M. in length, 25 M. in width and 10.65 M. in depth (740, 82 and 35 feet). The canal has been exca-



Railway Bridge near Velsen.

vated through the dunes or sand hills to the Wykerlake, which communicated with the Y, formerly an estuary of the Zuyderzee. In order to connect the canal with Amsterdam, a dam has been made in the Y, east of the city. By doing this the Y was changed into a lake which was drained. Through this drained lake or "polder" the canal was led which by

means of dredging was given the required depth. At present the canal has a bottom-width of 50 M. (165 feet) in the straight parts and of 60 M. (198 feet) in the curves; the gradient of the slopes is 3:1, and the depth is 9.80 M. (31 feet) under the canal level. It is spanned by two bridges, viz. by the two above-named swing-bridges, with a free passage of 55 M. (180 feet). An electric plant at Ymuiden provides the necessary energy for moving the doors of the locks and their sliding valves at Ymuiden, and for lighting the canal.

The maximum dimensions for which it is navigable have been settled as follows: length 220 M., width 24 M., depth 9.20 M. (726, 79, 30,5 feet) whereas a maximum speed of 10.5 K. M. (6.5 miles) an hour is allowed.

The total cost of construction amounted to about f 70.000.000 (\$ 28.000.000), the cost of maintainance till January 1st 1914 to f 13.000.000 (\$ 5.200.000).

In 1913 4985 vessels passed through the locks of Ymuiden, with a net tonnage of 26.000.000 M³. contents (9.100.000 reg. tons); during the preceding 10 years there had been an increase of 60 per cent.

The Government realizing of what vital importance it was that even after the improvements of 1907 the canal should be kept navigable for vessels, that are continually being built larger, a Royal Commission was appointed in 1909, to examine into the measures required for this purpose. In their report of 1912, this commission advised the building of a new large lock at Ymuiden, stating moreover that both the canal and the outer canal will in course of time have to be deepened, to meet the requirements of navigation.

A bill is proposed ordering the construction at Ymuiden of the greatest lock in the world; it is to be 400 M. long, 45 M. wide, and 15 M. deep (1320, 148 and 49,5 feet).

As Amsterdam has already been a harbor of importance for many centuries, it has an extensive system of minor harbors and canals which once served as mooring-places for the ocean-going ships. The building of a railway on the outer side of these harbors in a large measure hampered the navigation and as good as cut them off from traffic. This led to a

further development of the harbor-complex destined for ocean-traffic, which has been constructed since in the wide part of the Y, on the other side of the railway, while the older harbors are now being mainly used for inland shipping which in Amsterdam is considerable.

The oldest part of the modern harbor is formed by the "Commercial quay" (Handelskade) which extends over a length of 2200 M. (2400 yards), on the south side of which the inner harbor is situated, chiefly used for Rhine boats. This quay is provided with 31 travelling cranes having a lifting capacity of from $1\frac{1}{2}$ to 6 tons, and at its head with a fixed 30 ton crane. Nearly the whole length of the "Commer-



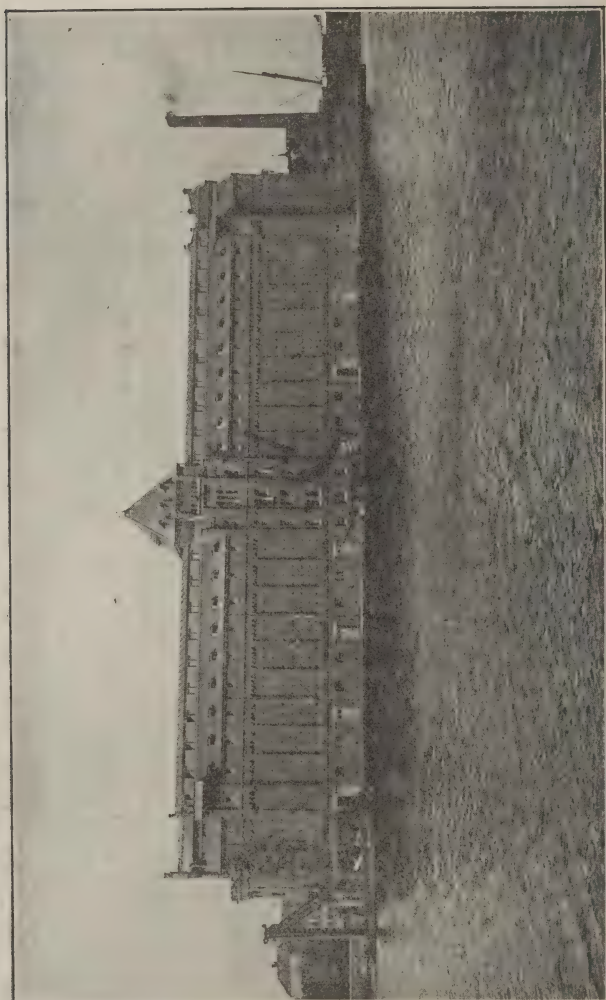
Steamferry-boat at Velsen.

cial quay" is covered with storehouses and sheds, provided with every modern requirement for the depositing of goods, e. g. refrigerating stores for fresh fruit.

When the "Commercial quay" proved insufficient for ocean-going vessels, the construction of the Y-island (Y-eiland) north of the quay was commenced. On this island over a length of 3700 M. (4000 yards) new quays were erected, in front of which a depth of 9.30 M. (31 feet) is available. This Y-island also is equipped with modern sheds and storehouses and possesses 70 electrically operated travelling-cranes from $1\frac{1}{2}$ to 6 tons lifting power, whilst the Royal



Petroleum Harbor at Amsterdam.



Grain Silo at Amsterdam.

Steamship Company, which has its berths on the Y-island, has a 30 ton crane of her own

To the east, past the railway crossing, the extension of the "Commercial quay" forms the Ore quay (Ertskade), which has a length of 310 meters (340 yards). It is fitted with machinery for loading and unloading coal and ore; a coal tip belonging to one of the railway companies is also erected here. The bunkering of vessels however, has of late often been done by means of a floating coal elevator belonging to the Steenkolenhandelsvereeniging (Coal Trading Association).

Two docks are to the south of the ore quay, viz. the Railway Dock and the Entrepot or Bonded Stores Dock, both furnished with an entirely modern harborplant; here even the biggest steamers coming to Amsterdam can find a berth.

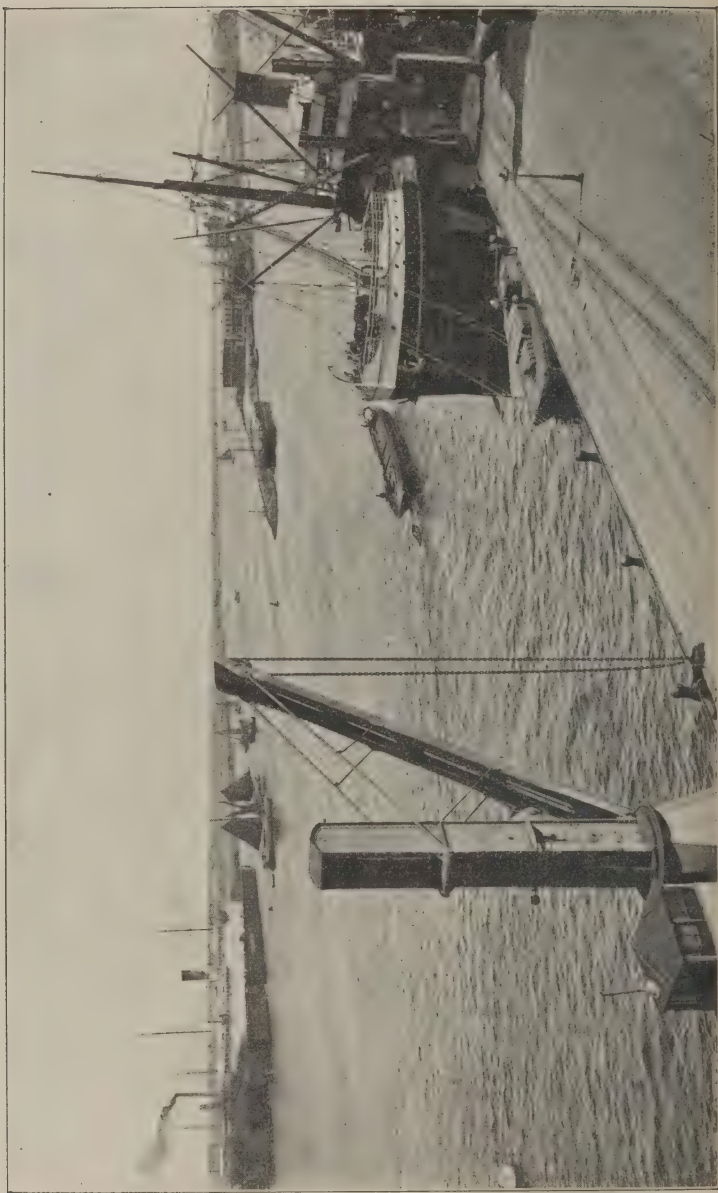
The ground North of the Y is destined for industrial purposes, and has to a large extent already been taken into use.

To the west of the head of the Commercial quay the De Ruyterkade is situated, skirting the town, and fitted out with numerous landing-places for the regular inland services

In the western part of the harbor first a stone pier used by the Holland-America line must still be mentioned, then a large grain silo, and finally the Extensive Timber Docks and the Petroleum Dock. At present the port of Amsterdam possesses more than 10 Kilometres (6,2 miles) of wharfs connected with the railways and provided with cranes, while the storage capacity in the port, alongside of deep water, amounts to more than 100,000 M². (110.000 square yards) in sheds and more than 110.000 M². (120.000 square yards) in warehouses. This does not include the space occupied by private warehouses in the city.

A description of the important industrial concerns that have established themselves along the Amsterdam harbors, and that employ the necessary floating docks and appliances for repairing ships, cannot here be inserted.

While the channels leading to the harbor are kept in repair by the State, the harbor itself is entirely managed by



The floating Docks, the Ykade and the Handelskade at Amsterdam.



Holland Steamship Co's Fleet and Wharves Amsterdam.



Coaling-tip at Amsterdam.

the City Corporation, which has already spent more than 30 million guilders (\$ 12.000.000) on it.

Meanwhile a great extension of the harbors west of the city has been projected, amongst others a dock of 4500 M. (5000 yards) in length, furnished with numerous piers and jetties, which will increase its berthing capacity. The cost of this dock has provisionally been estimated at f 26.000.000 (\$ 10.400.000). Besides, a new petroleum dock and extensions of the timber docks have also been projected.

Evidently, the Corporation of Amsterdam are firmly resolved to make their port comply with the highest demands of shipping, and in good time to provide the sites and instal-



Bonded Stores at Amsterdam.

lations required, to keep up with the progress of navigation.

Although the prominence of Amsterdam as a port of transit has been increasing of late, the large number of sheds and storehouses still reveal its essential character as a storage-port, especially for products from the colonies. For some of these, tobacco f.i., it has become one of the greatest emporiums of the world. Herein doubtlessly lies the economic significance of Amsterdam for the trade of the Netherlands in general. Besides this, Amsterdam is the seat of numerous important Netherlands steamship lines, that carry on a regular service with the East and West Indies, South-America, the ports of England and the continent of Europe. The

various Amsterdam steamship-companies own 210 ships of about 560.000 register tons together

The growth of shipping in the port of Amsterdam is indeed considerable; since 1877 it has grown 5 times as large, and from 1900 to 1910 the increase was about 40 per cent.

The total value of the colonial products imported into Amsterdam in 1913 amounted to almost *f* 200.000.000 (\$ 80 000.000)

THE PORT OF ROTTERDAM AND THE ROTTERDAM WATERWAY.

The history of the entrances to the port of Amsterdam is remarkably similar to that of the Rotterdam port.

Rotterdam is situated on the Nieuwe Maas which at one time emptied itself into the sea through the Scheur and the Brielsche Maas; the mouth however was so shallow that in the beginning of the nineteenth century, this waterway proving inadequate to meet the demands of shipping a remedy was found by digging a canal through the island of Voorne, between 1827 and 1829; at the mouth of this canal a sufficiently deep estuary was reached.

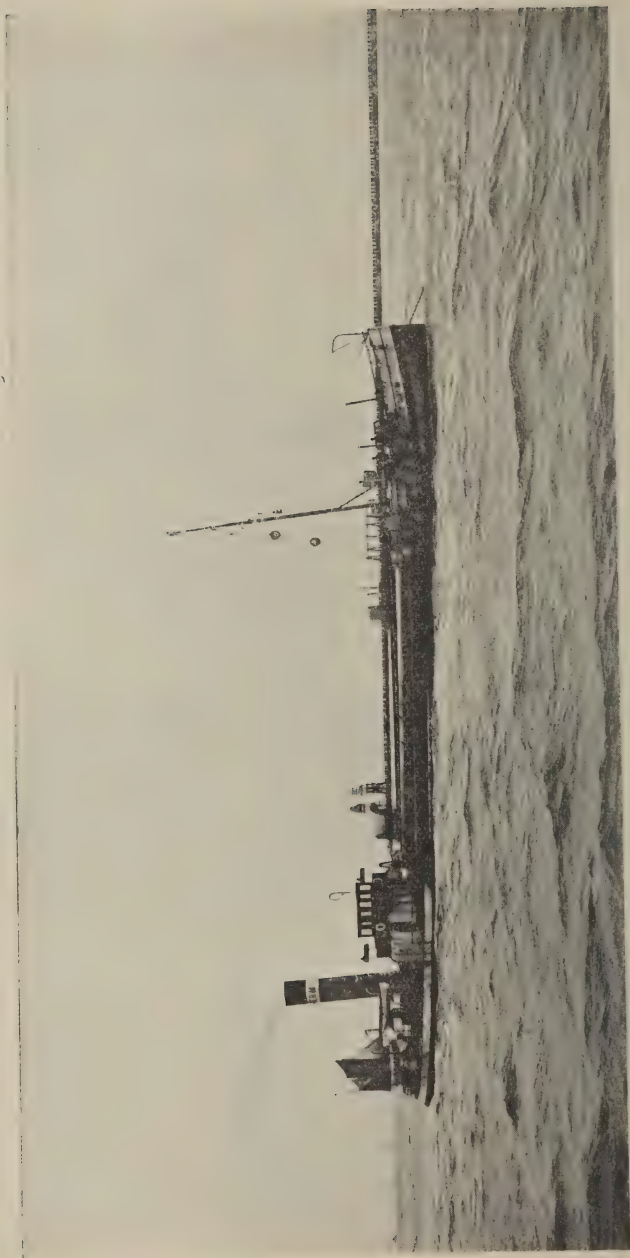
This canal, which is very similar to the North-Holland Canal, had a depth of only 5,5 M. (18 feet). Towards the middle of the last century it proved insufficient for ocean-traffic. As in Amsterdam, another solution of the difficulty was sought.

P. CALAND, a most capable engineer of Waterstaat, in 1858 drew up a plan for the improvement of the river and forming a new outlet through the dunes from the Scheur to the Hook of Holland. Two moles were made, consisting of mattresses of fascines covered with a huge stone revetement between piles, and stretching from the shore into sea to a depth of 6.5 M. (21.5 feet) at low tide. The entire improvement of the river extended from Krimpen over a distance of 44 K.M. (21 miles).

Mr. CALAND's opinion was that, if only a channel of 50 M. (165 feet) wide and 3 M. (9,9 feet) deep were made, the



A Dredgermachine in the Waalhaven, at Rotterdam.



Self-loading Dredger in the Entrance of the Waterway *).

*) Taken from the Work: Waterway from Rotterdam to the Sea, by A. T. de Groot, Waterstaat Engineer.

scouring capacity of the tides would shape the river bed naturally.

In August 1833, the works were commenced, and were energetically carried on under Mr. CALAND's management. On November 26th 1838, the new river-bed was ready as far as the sea, and on March 9th 1872, the first steamer, with a draught of 3 M. (9,9 feet) left the New Waterway.

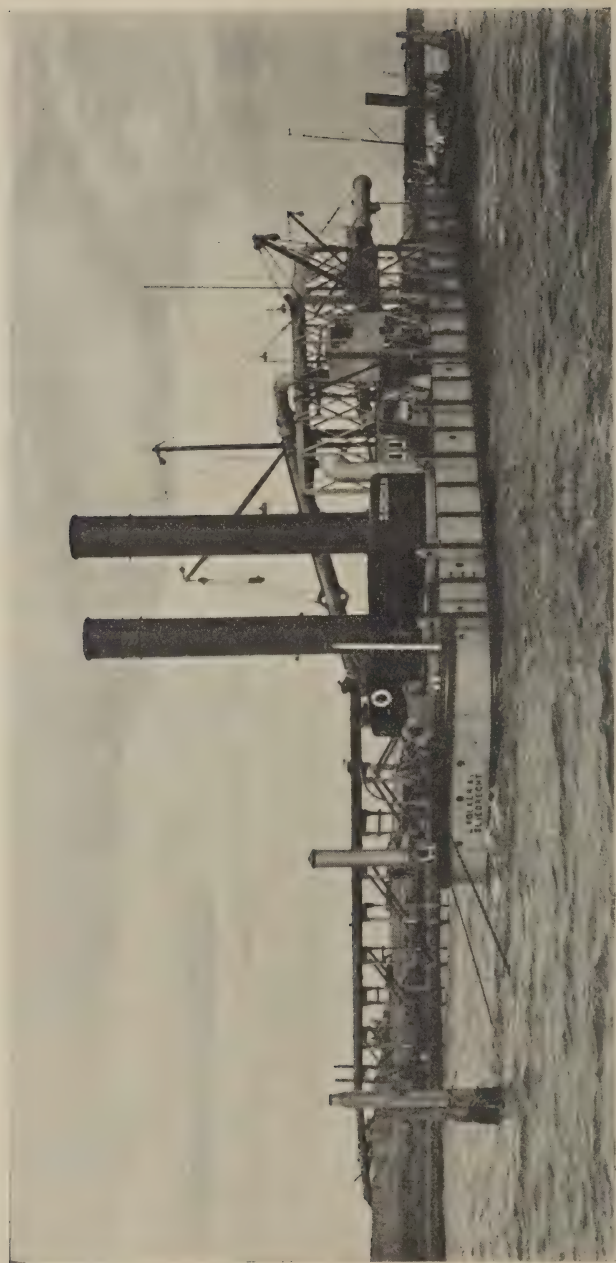
Mr. CALAND's expectations about the new riverbed naturally shaping itself through the influence of the tides, were not realized, which fact gave rise to various difficulties. In 1877 a Royal Commission was appointed to advise in this matter; in their report the Commission unanimously maintained the principle of the open way, and advised against the construction of locks. In order however, to give the new river the required dimensions, they advised effectual dredging works as imperative.

The advice of the Commission was followed, and the works were continued under the engineer W. F. LEEMANS who was able to attain the most satisfactory results.

The technical difficulties which had to be surmounted, in connection with the continually increasing demands of shipping, during the correction of the Rotterdam Waterway, will not be treated here. Suffice it to state that after the completion of the works, prescribed by the law of March 25th 1908, an uninterrupted channel of a depth of 8.5 M. (28 feet) at low tide and of about 10 M. (33 feet) at high tide has been constructed from Rotterdam to the sea, through which large transatlantic liners drawing from 93 to 94 dM. (30.5 to 31 feet), can pass in either direction.

The cost of construction and improvements of the Rotterdam Waterway up till 1914 amounted to (about *f* 42.500.000 (\$ 17.000.000), the cost of maintainance to *f* 9.000.000 (\$ 3.600.000); at present the cost of maintainance is about *f* 450.000 (\$ 180.000) a year, of which *f* 200.000 (\$ 80.000) goes to pay the dredging works.

In 1913 at the Hook of Holland a total of 22.645 ships, measuring about 78 000.000 M³. (27.500.000 reg. tons) have been cleared in and out. During the last 10 years an increase of 56 per cent. in the tonnage has been observed.



*) Cf. note on p. 22.



The Maas Harbor at Rotterdam.

Although the waterway from Rotterdam to the Sea at present complies with the demands of shipping, the increasing size ships will probably make greater demands on the waterway before long. Therefore a bill is proposed for further improvement which will aim at constructing a channel of at least 10 M. depth under low tide. (11.5 M. = 38 feet under high tide).

Rotterdam is situated on the right hand bank of the river, and in former centuries the sea-craft was moored on that side, as the numerous small harbors in the old town, that are now being used for inland shipping, testify. When in the middle of last century an improvement was necessary, this was mostly achieved by building new or improving old quays along the river (the Boompjes, the Wester and Willems quay and the Veerhaven).

In the seventies a more energetic extension of the harbor was begun, this time on the left hand bank of the river, called Feyenoord. When once this had got railway communication by means of a bridge across the river, the Rotterdam Commerce Association constructed the "Binnenhaven" there at a cost of f 13.000.000 (\$ 5.200.000) it has a length of 1000 M., a width of 80—40 M. (264—132 feet), and a depth of 7 M. (23 feet) at low tide. Next came the Entrepot-harbor (200 M. long, 60 M. wide and 7 M. deep at low tide), (660, 198 and 23 feet). The entire harbor-system was made over to the Municipality.

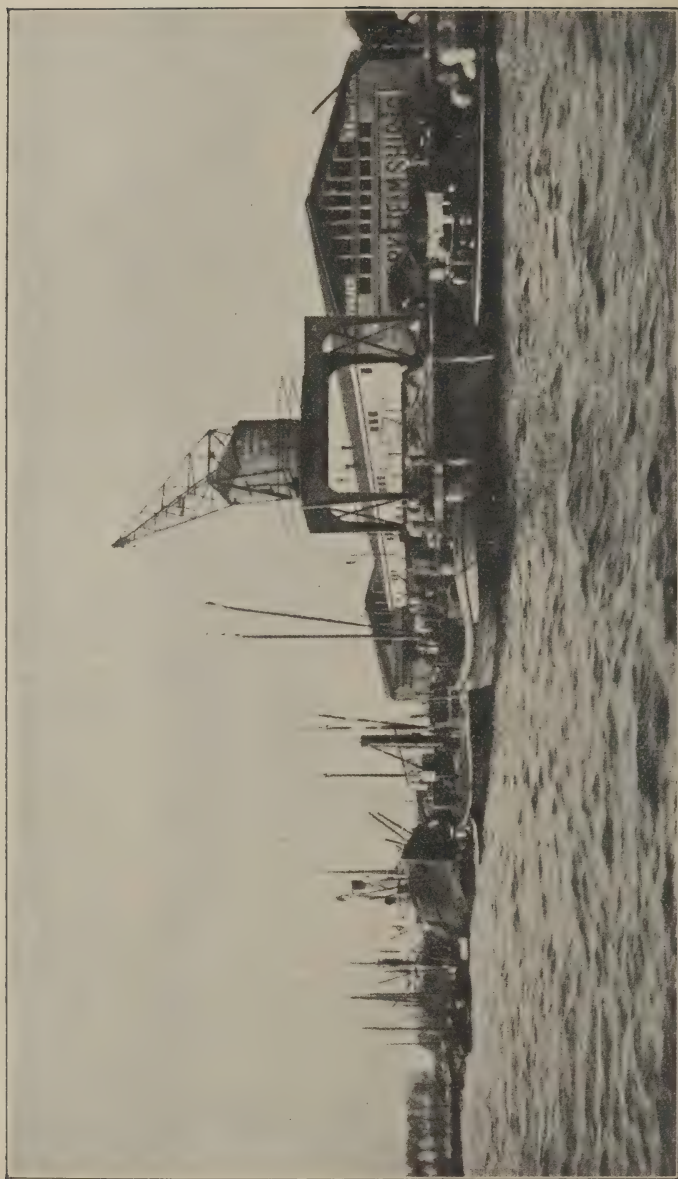
The Municipality, in cooperation with the State, had already constructed the "King's harbor" (Koningshaven), wide 150 M. (495 feet), and deep 6 M. (19.5 feet) at low tide, and the railway harbor: a dock 1100 M. (3600 feet) long, 115 M. (374 feet) wide, and 4.70 M. (15.5 feet) deep at low tide.

Further extension of the port has mainly been on the left hand bank of the river both below the Feyenoord harbor-complex, and above it; on the right hand bank lower down the space was also rendered available for industrial establishments.

Below the railway harbor, the Wilhelmina quay is situated alongside of deep water. There the transatlantic



Holland-America Line.



Park Harbor at Rotterdam.

steamers of the Holland-America line find a berth. In 1887 the digging of the Rhine harbor (Rijnhaven) was commenced, extending over an area of 30 H. A. (74 acres); this basin formed the first specimen of the new type of harbor. In Rotterdam the transit traffic of bulkgoods plays so prominent a part, that its harbors need a large water-surface; on the other hand unlike the Amsterdam harbors they require but a comparatively limited length of quays.

The main point for Rotterdam is to offer ample space for the ships to moor alongside of mooring-posts and buoys so that on all sides the lighters and other riverboats can quickly transship the cargoes. That the traffic with the interior is chiefly carried on by water, is manifest in the harbor-system of Rotterdam.

Besides in the above-named Rhine harbor, (with a low-tide depth of 7.5 to 9 M), (24.5 to 29.5 feet) and in the river itself, mooring-places are to be formed in the Maasharbor, (having an area of 60 H. A., 150 acres) which was opened on December 20th 1901, and in the not yet completed Waalharbor, which has got the same depth as the Rhine-harbor and is intended to cover an area of 310 H. A. (775 acres). According as the need arose, quaywalls have been erected alongside of the docks, and the sites back of them have been used for storage-houses and sheds, and provided with rail-ways and cranes.

On the left hand bank, between the entrances to the Rhine in the Waalharbor, two minor harbors have been constructed, the 1st and 2nd Katendrecht harbor; further the Petroleum-establishment is situated past the entrance to the Waalharbor.

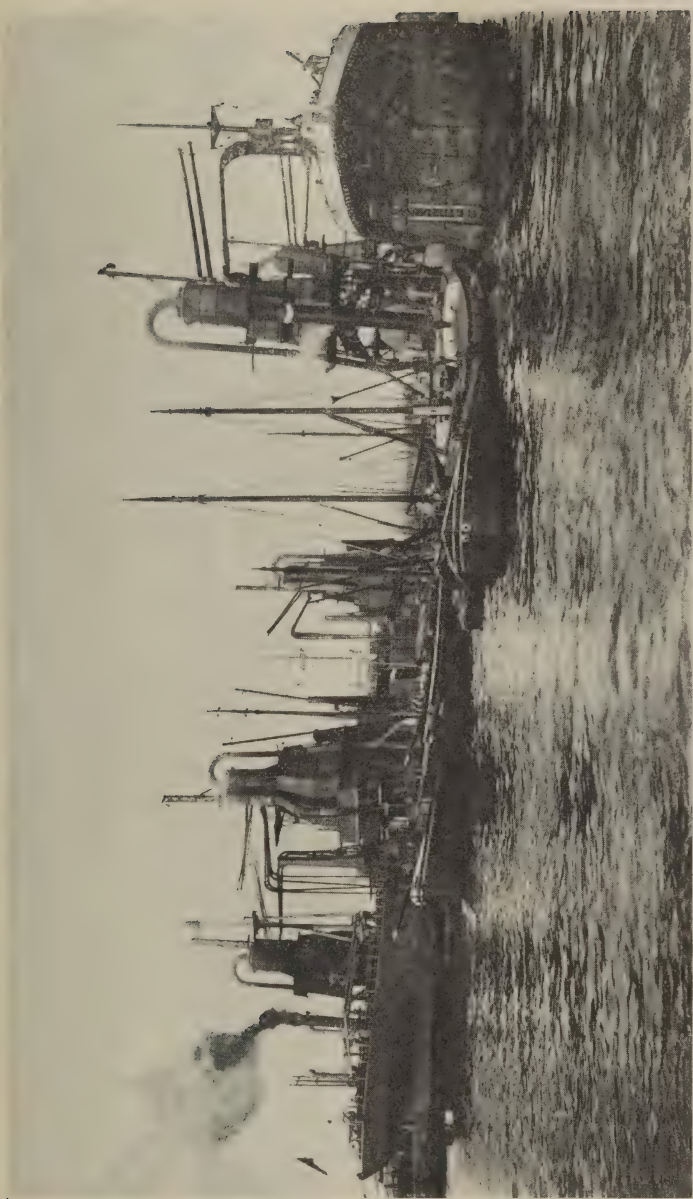
On the right hand bank, below the old town, there are still a number of minor harbors, surrounded by quay-walls and leased chiefly by the regular-service boats.

The wharves of Rotterdam are 41 K.M. (25.5 miles) in length, and the harbors cover a surface of more than 250 H. A. (625 acres).

The transit-traffic of Rotterdam being considerable, care has been taken that the harbor-plant complies absolutely with the demands of the present day, and that loading



Rhine Harbor at Rotterdam.



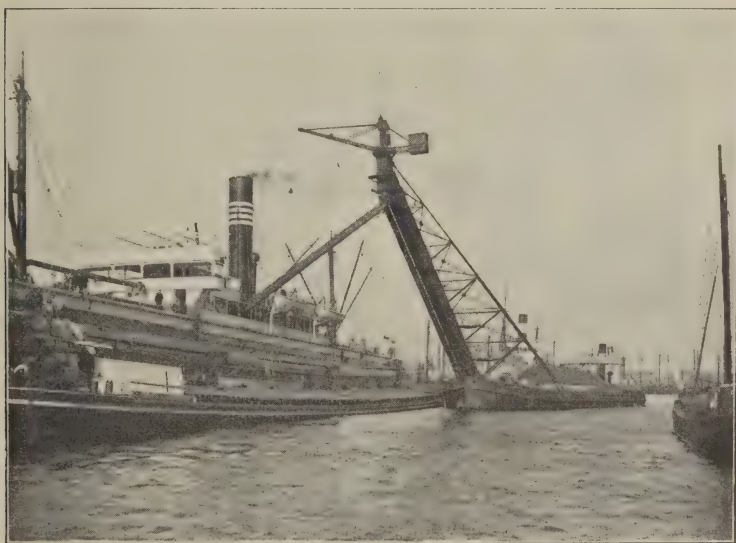
Grain-elevators in the Maas Harbor at Rotterdam.



Coal loading on Stream near Rotterdam.

and unloading can be done by means of the most modern appliances.

Along the various quays there are more than a hundred wharf-cranes with lifting-capacities of from 1500 to 30.000 Kilos, (1.5 to 30 tons), and an ever increasing number of floating cranes with lifting-capacities of from 16 to 125 tons being used. For the unloading of grain floating grain-elevators are used, which can store 200 tons of grain in an hour. For the loading of coal and the bunkering of ships floating installations have been made, the biggest of which



Loading Facilities in the Harbor of Rotterdam.

can transfer up to 670 tons an hour. Moreover Rotterdam possesses various wharves and docks, for shipbuilding and repairing.

The enormous increase of traffic causes the municipality, even through the Waalharbor has not yet been finished, to consider new plans for a further harbor-extension, on the left bank of the river, below the Waalharbor. Here a few

harbors have been planned amongst which two of about the size of the Waalhaven (310 H.A., 775 acres). For the realization of the plans, 1500 H.A. (3750 acres) of land will have to be expropriated.

Though a number of Netherlands shipping companies maintaining regular services to New-York, the East-Indies and various European ports, are established at Rotterdam, that port is obviously the seat of the transit traffic, of which the trade in ore, grain, coal and timber plays the most prominent part.

In 1913, 2238 ships of ore with gross contents of almost 16.000.000 M³. (5.650.000 reg. tons) and 1889 ships of grain with gross contents of almost 19.000.000 M³. (6.700.000 reg. tons) were cleared in.

In Rotterdam as well as in Amsterdam a considerable increase in the shipping-trade is apparent; it having multiplied nine times in 40 years and the import into Rotterdam between 1904 and 1913 increased with 68 per cent.

MEANS OF COMMUNICATION FOR AMSTERDAM AND ROTTERDAM WITH THE INTERIOR.

As has already been stated, such excellent means of communication by water between the ports and the interior as in the Netherlands where 3 large rivers, the Rhine, the Maas and the Scheldt flow into the Sea, will rarely be found elsewhere. The principal of these rivers is the Rhine. Soon after reaching the Netherlands territory, where it is called Upper Rhine, it divides into two arms, of which the Waal, the more important one of the two, flowing west, changes its name to Merwede below Gorinchem. Through the Noord it communicates with the Nieuwe Maas, on which Rotterdam is situated. The northern arm of the Upper Rhine, the Pan-nerden Canal as it is called, branches off into two streams, one of which, flowing towards the west, under the names of Nether Rhine and Lek, unites with the Noord, and forms the Nieuwe Maas. The other branch flows northward, under the name of Yssel, into the Zuyderzee. The discharge of water from the three Rhine arms, the Waal, the Lek and the



Hollandsch Diep with Railway Bridge near Moerdijk.

IJssel respectively, is $\frac{2}{3}$, $\frac{2}{9}$ and $\frac{1}{9}$ of the total discharge of the Upper Rhine. All these branches are navigable. As the map of the Netherlands shows, the Maas traverses a considerable part of our country; above Venlo however it is practically unfit for navigation. Owing to too great a fall and scarcity of water, it becomes too shallow in times of drought, while the current is too strong during the wet season.

In order to meet these difficulties, the Government made a lateral canal, called the Zuid-Willemsvaart, leading from the Maas near Bois-le-Duc to Maastricht and crossing part of the Belgian territory. It communicates with the Liege-Maastricht Canal, and from there with the entire network of Belgian and French Canals. Via Andel the navigable lower part of the Maas is connected with the other rivers, and by the Bergsche Maas and the Amer with the large waterways of the provinces of Zeeland and South-Holland, from where the Scheldt and Antwerp can be reached.

In our country the Scheldt is more like an estuary than a river. All direct communication with other Zeeland and South-Holland waterways has been stopped, since the Easter Scheldt and the Sloe were dammed off. For this reason the canals through South-Beveland and Walcheren were made, leading from Hansweert to Wemeldinge and from Flushing to Veere. Thus the shipping communication from Antwerp to Rotterdam has been reestablished.

From the foregoing it will be seen that Rotterdam enjoys direct communications with the entire system of our rivers and large waterways, which technically as well as financially are absolutely free, i. e. they are free from weirs and locks, and no dues are levied.

Amsterdam is not so favorably situated; its port is more especially adapted to the canal traffic. Through the Merwede Canal, it is connected with the network of big rivers, with the Lek near Vreeswyk, and with the Merwede near Gorinchem, while a series of canals connect it with Rotterdam.

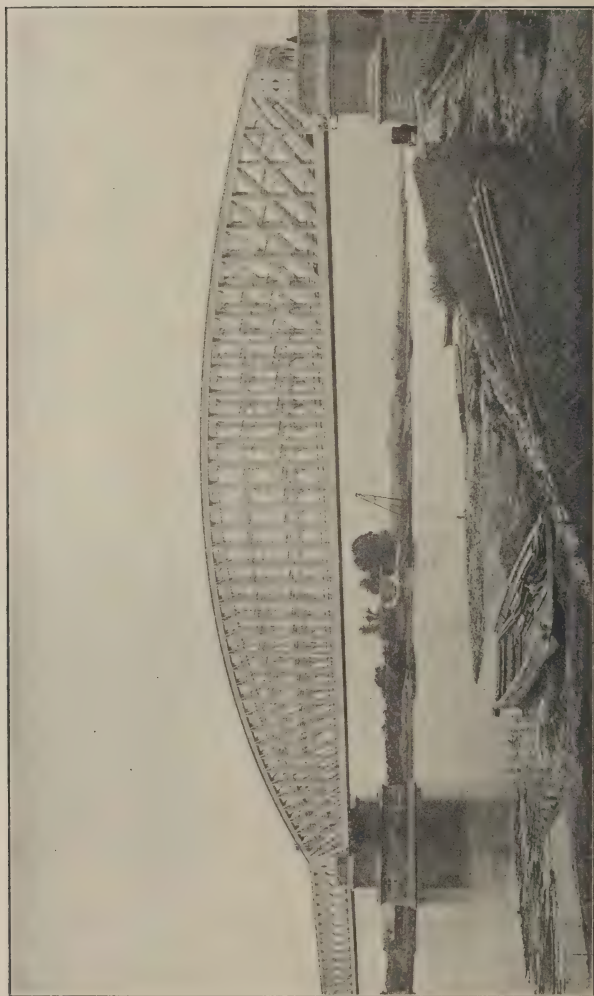
A most significant inland goods traffic is carried on from Amsterdam via the Zuyderzee to various minor ports, to the mouths of Yssel and Zwartewater, and to the provinces in the North.

For inland navigation the most important of all waterways is the one leading from Rotterdam to the Rhine, through Noord, Merwede and Waal. It forms the link between Rotterdam and the great industrial region of North-Western Germany. Therefore it is absolutely necessary, and a matter of national importance to keep this waterway in the best possible condition.

Rotterdam happens to be destined by nature as the port of nearly the entire industrial region of Westphalia and the Rhine provinces. To be sure, canals are being made in Germany in order to connect these regions with the German ports, but canal-shipping with its many locks offers such difficulties even in a comparatively level country, that at all times the ships will prefer the free navigation on a river, as long as that complies with the demands of modern times, a fact which is surely recognised also by the parties concerned in Germany. As long as our rivers, and the waterway of the Rhine in particular, are kept in a good condition, Rotterdam trade, and in consequence our country, will surely always be supported from that side.

The largest of inland boats at present are those used for Rhine shipping; they are lighters, which are towed, and comparatively simple in construction. The biggest Rhine-boat has a length of 123 M., a width of 14,08 M. and a draught of 2,85 M. (405, 46, and 9.4 feet). They measure 3581 tons. Ten of these boats will hold the entire cargo of the biggest transatlantic steamer. A big Rhine "aak" (barge) has an average length of 100 M., a width of 12 M., a draught of 2,75 M., (330, 39 and 9 feet) and a tonnage of 2000 to 2200. The greatest Rhine traffic is carried on between Rotterdam and the main centres of the industrial regions along the Rhine. The distance from Rotterdam to Duisburg-Ruhrort is 214 K. M. (132 miles), to Cologne 307 K. M. (190 miles).

Having been properly improved, the rivers offer a constant and wide fairway; the normal width of the Waal is 260 M. (858 feet), the low-tide depth is more than 3 M. (9.9 feet). In Lek and Yssel that depth is more than 2.5 M. (8.2 feet) and 1.80 M. (5.9 feet) respectively, whilst the



River Lek with Railway Bridge near Kaillenburg.

average depth of the fairway measures 1 M. (3.3 feet) more.

The Rhine is spanned by a number of fixed bridges, which, however, leave a free passage of 9 M. (30 feet) or more above the highest navigable water-level.

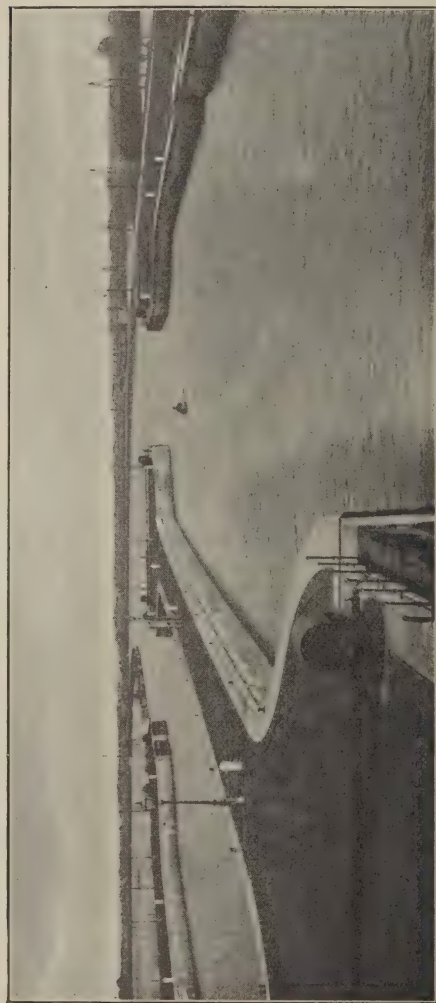
Of late a Rhine and sea-trade has developed for small sea-craft of a maximum of from 1400 to 1500 tons, which carry on a regular service between Cologne and the German and English ports. This is owing to the excellent condition in which the fairway below Cologne is maintained.

Belgium also profits by this Rhine shipping, as far as the traffic from Antwerp to Germany is concerned; of the entire shipping traffic on the Upper Rhine about 15 per cent. falls to the Antwerp Rhine trade.

A few figures will give an idea of the immense significance of the Rhine traffic. In 1913 the total import at Rotterdam, the second port on the continent of Europe, amounted to 22.000.000 tons of 1000 Kilo, while the total traffic on the upper Rhine in both directions amounted to 37.500.000 tons; Amsterdam obtained 1.5, Rotterdam 23, the Netherlands altogether 35, Belgium 9 and the oversea traffic 0.5 million tons of this traffic. Traffic on the Rhine appears to be equal to that in the biggest ports of the world.

The following particulars concerning the above-named canals, that form the main communications, may be of interest. The largest ships for which the Merwede-canal is navigable, have a length of 100 M. (330 feet), a breadth of 10.5 M. (34.5 feet), a draught of 2.60 M. (8.5 feet). Though in special cases these dimensions can be deviated from, the very largest type of Rhine-barge cannot pass through the canal. For Amsterdam this is not yet a serious obstacle. As has already been mentioned, the transit-traffic there is less comprehensive than that of Rotterdam, consequently there is less demand for these largest-sized Rhine-boats, which moreover do not offer such a considerable economising in the expenses per ton, when compared to the other large-sized boats for which the Merwede canal is navigable.

The maximum dimensions of the ships allowed in the canals of Zuid-Beveland and Walcheren have been fixed respectively as follows: length 100 M. and 130 M., (330 and



Locks at the Entrance of the Merwede-canal near Amsterdam.

429 feet), breadth 15.75 M. and 19.75 M., (52 and 65 feet), draught 6.20 M. and 7.10 M. (20 and 23 5 feet).

The Zuid-Willemsvaart, for the traffic to the Maas-district, has naturally been planned for a smaller type of craft, the maximum dimensions being 50 M. length, 5 M. breadth, 1.90 M. draught (165, 16.5 and 6.3 feet). There too the shipping is considerable: in 1913 16.447 ships, measuring a total of 4.519.444 M³, (tons) passed through the canal in both directions. In 1913, 40.188 ships measuring 3.203.430 M³. (tons), went through the Mallegat Lock, from Amsterdam to Rotterdam, while every year about 60.000 vessels pass through the Orange locks, which form the connection between Amsterdam and the Zuyderzee on the eastside.

MINOR PORTS AND OTHER WATERWAYS.

Though, as has been stated before, the sea-trade has to a large extent been concentrated to the two largest Netherlands ports, there are a number of minor ports of some, if mainly local, interest.

In the North-east of the country we find in the first place the port of Delfzyl, situated on the Eems, opposite the German port of Emden, where the Dortmund-Ems canal joins the sea. Formerly the town of Groningen was a seaport, where a fairly significant trade in grain was carried on. The Eemscanal connects Groningen with the the outer harbor of Delfzyl and with the Eems. It is fitted out with a lock through which no larger ships than of 60 M., length, 10.5 M. breadth, and 5.30 M. draught (198, 34,5 and 17.5 feet) can pass. To-day these dimensions are of course insufficient even for smaller sea-craft.

Delfzyl being easily reached by large ships, owing to the great depth of the Eems, its outer harbor has been considerably improved during the first years of this century; now it has a low-tide depth of 7 M. (23 feet) and a high-tide depth of nearly 10 M., (33 feet), enabling ships of a considerable size to unload there. A significant import trade in timber from Norway and America and in coal is carried

on, while products from the neighboring Groningen fen districts, such as straw, straw-board, and farina, form the staple export.

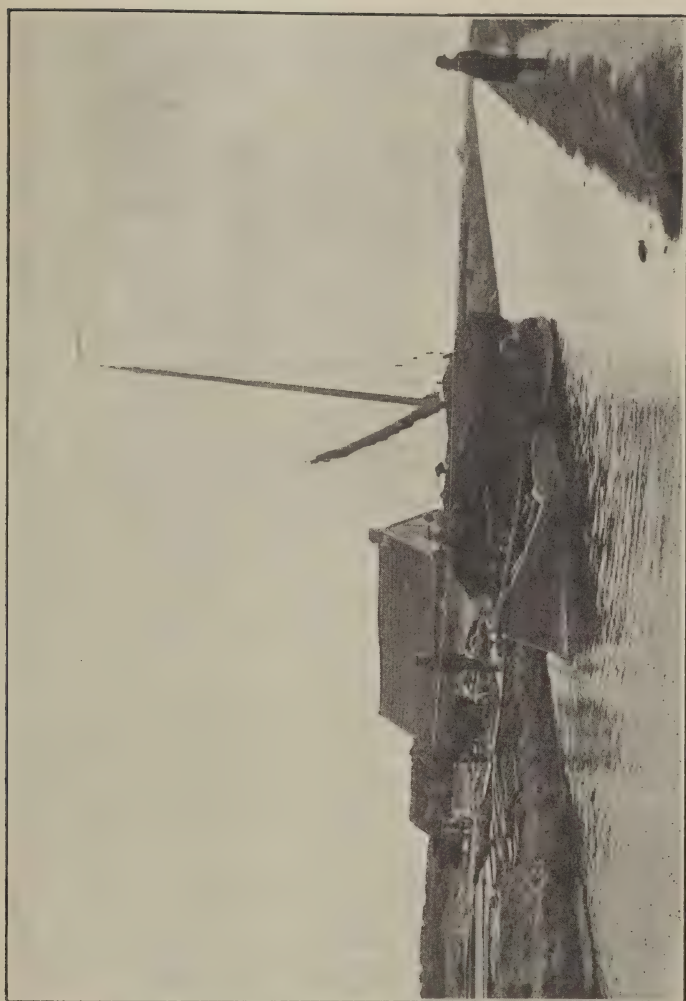
The above mentioned Eems-canal, which offers an excellent fairway for inland shipping, connects Delfzyl with Groningen, a most important centre of canals, with a busy trade. Though the canals are of various dimensions, they are as a rule navigable for the national type of barge the "tjalk," which has a length of 20 to 24 M. (66 to 80 feet) a breadth of 4.5 to 5 M., (14.3 to 16.5 feet) a draught of 1.50 to 1.70 M., (5 to 5.5 feet) and which measures 60 to 150 tons.

The following table gives a survey of the traffic on some of the principal Groningen canals in 1913.

CANALS.	Number of ships.	Contents in M ³ . (tons).
Eems Canal	7909	960.992
Winschoterdiep	2730	184.220
Reitdiep	7679	552.473

The Winschoterdiep which is mentioned in this table forms the connection with the Fen District, of which more will be said later. Part of the shipping to Amsterdam goes through the Reitdiep.

On examining the map of the North-east of our country in various places a very close network of canals will be observed. There the so-called Fen-Colonies lie. Once that land was covered by marshy soil, formed by the remains of a vegetation which has been decaying there for centuries. This soil is dug away and cut to produce peat, which is used as fuel. For transferring the peat and also for draining the land, numerous canals are needed, which form a typical feature of this part of the country, and a fruitful source of economic development. After cutting away the peat, the soil forms excellent arable land, consequently various industries connected with agriculture, principally strawboard and farina factories, have sprung up, causing a brisk shipping trade.



Canal in the Fen-districts.

Canals steadily multiplying, the need of more ships was felt, giving a renewed impetus to shipbuilding.

Besides inland boats and towing-barges for the German canals, smaller sailing vessels are being built for the coasting-trade, especially fore and aft schooners. The fen-canals originally constructed to transport peat and to drain the land, have effectually contributed to the prosperity of entire districts.

After this description of the fen-canals, it should be mentioned that more to the south Zwolle is an important centre for inland shipping. However, the canal-system between Zwolle and Deventer to the east of the IJssel, is of rather limited dimensions. The canal west of the IJssel, from Dieren via Apeldoorn to Zwolle, was originally constructed as a lateral canal, to avoid the then unimproved IJssel. At present it is no longer needed for that purpose, so that now it is of a purely local value.

A few words must still be devoted to the port of Harlingen, which has about the same significance as that of Delfzyl. Because of the shallows in the fairways of the various straits leading to the sea, this port is not accessible for ships of such a deep draught as that of Delfzyl. When the tide is high however, fairly big sea-craft can enter; these chiefly carry timber from Norway. Besides timber, the import of coal is worthy of mention. The export mainly consists of meat, dairy-produce, and some products, more especially paper, from the fen-district. The regular services with England are of most importance here. A lock connects the harbor with the network of waterways in Friesland; in 1913 16,500 ships measuring 1,290,610 M³. passed through this lock, part of this traffic being from Friesland and Groningen.

Glancing further down the coast line, den Helder will be observed, which is a naval base and of no special importance for trade. The canal connecting den Helder with Amsterdam, the Great North Holland Canal, which formerly served for the ocean traffic to Amsterdam, is now merely of local value; its dimensions are larger than is needed for the inland shipping of to-day; ships of a length of 64 M., a

breadth of 14 M., and a draught of 5 M., (211, 46 and 16.5 feet) pass through it. Though truly a waterland, this part of the country possesses very few canals besides this one, that are navigable for vessels of any considerable size.

The country to the south of the North Sea Canal is better equipped in this respect. It has an extensive net of good waterways, to which moreover many improvements are still being made.

The harbor of Zaandam must also be noticed, as being of great significance for the import of timber from Norway and America. It is situated on the Zaan, at a short distance from, and in open communication with the North Sea Canal; in consequence this harbor profits by the good condition in which the entrance channels to Amsterdam are kept.

As ports for fishing boats need not be discussed in this survey, no detailed account will be given of those of Ymuiden (the fishing harbor), Scheveningen, Maassluis and Vlaardingen, the latter two situated on the Rotterdam Waterway: that of Ymuiden is one of the most important of European fishing ports; in 1913 the fish sold here realized *f* 7.000.000 (\$ 2.800.000).

One of the commercial towns most affected by the concentration of ocean-traffic is Dordrecht, on the Merwede. Unlike Delfzyl and Harlingen, Dordrecht, lying entirely within the sphere of influence of Rotterdam, fulfills no function, however limited, for any inland places. Yet all hope is not abandoned, and the town is even planning the construction of a new harbor for vessels with a draught of 7 M. (23 feet). Dordrecht has to rely mainly on its own commerce; for various industries the raw material has to be brought, often in shiploads.

When the harbor of Flushing, mainly of significance, because of the twice-daily service with Queensboro, is still mentioned, the principal Netherlands sea-ports have been described; and the only remark, still to be made, is that the entrance to the harbor of Ghent through the Ghent—Terneuzen canal lies on Netherlands territory. The maximum dimensions of the ships allowed on this canal are: length 140 M., breadth 17 M., draught 8 M. (462, 56 and 26.4 feet);



A View on the Nether-Rhine.

in 1913, 3771 ships passed through the locks at Terneuzen, measuring about 11.000.000 M³. (3.900.000 reg. tons).

Finally, the following table gives a survey of loading ships which entered and left the Netherlands ports in 1913:

Ports.	ENTERING.		LEAVING.	
	Number of Vessels	Tonnage nett. × 1000 K. G.	Number of Vessels.	Tonnage nett. × 1000 K. G.
Amsterdam . . .	2152	2310,4	1707	1843,6
Delfzyl	241	185,9	322	54,0
Dordrecht . . .	73	67,5	167	29,3
Groningen . . .	161	18,1	78	10,8
Harlingen . . .	342	157,9	386	162,6
Den Helder . . .	29	17,1	1	0,5
Hook of Holland .	602	370,6	367	348,6
Maassluis	160	123,1	73	25,1
Rotterdam . . .	8854	11637,8	6399	6527,1
Schiedam	29	22,8	22	2,5
Terneuzen	409	250,9	152	68,7
Flushing	813	841,0	829	841,7
Ymuiden	56	50,3	3	1,7
Zaandam	187	245,6	40	8,5

PROJECTED CONSTRUCTION OR IMPROVEMENT OF WATERWAYS.

While describing the ports of Amsterdam and Rotterdam, the important projects for extension and improvement that are being considered have already been mentioned. Further plans for the improvement of this country's waterways may now be set forth.

On the map it will be noticed that south of the Maas and the Zuid-Willemsvaart a fairly extensive region is devoid of waterways, notwithstanding the fact that there the important industrial centres of the province of North-Brabant are situated. Conditions there will be vastly improved

as soon as the canal from the Amer to the Zuid-Willemsvaart, the Wilhelmina Canal, now in construction, will be finished. This canal is to be navigable for vessels of about 60 M. length, 7 M. breadth, and 1.90 M. draught (198, 23 and 6.3 feet).

In the south-east of our country, in the province of Limburg, a number of coal-mines are being worked. Borings having proved the existence of extensive carboniferous strata, before long a considerable development of the mining-industry may be expected. Needless to say, an adequate waterway is a necessity for the transport of coal from the pits. To that end the upper part of the Maas will be made navigable.

A Netherlands-Belgian commission (the Maas forming the frontier-line over quite a long distance,) has devised a plan for the canalization of the river by means of weirs and locks, in order to render it navigable as far as Maastricht. From this town the canal to Liege would then form the connection with the Belgian and French system of canals. The commission's plan is based on the use of Rhinebarges measuring 2000 tons, with a length of 100 M., a breadth of 12 M. and a draught of 2.8 M. (330, 40 and 9 feet). Present circumstances make it impossible to consult with the Belgian government concerning the canalization of the part of the Maas along the frontier. A law has been enacted however ordering the canalization of that part of the river which is entirely situated on Netherlands territory, likewise the construction of a canal which is to join the Maas above Roermond with the Zuid-Willemsvaart. This will make it possible to convey the coal to the industrial district along the Wilhelmina-Canal.

Further a canal has been projected to join the Maas below Grave and the Waal; this is to form a short cut for the transporting of coal to the eastern part of the country.

To carry out all these projects a sum of about f 90.000.000 (\$ 36.000.000) will probably be required.

As has already been mentioned, the canals east of the IJssel have small dimensions. Yet in that very region, in Twente with its flourishing textile industry, the need of good

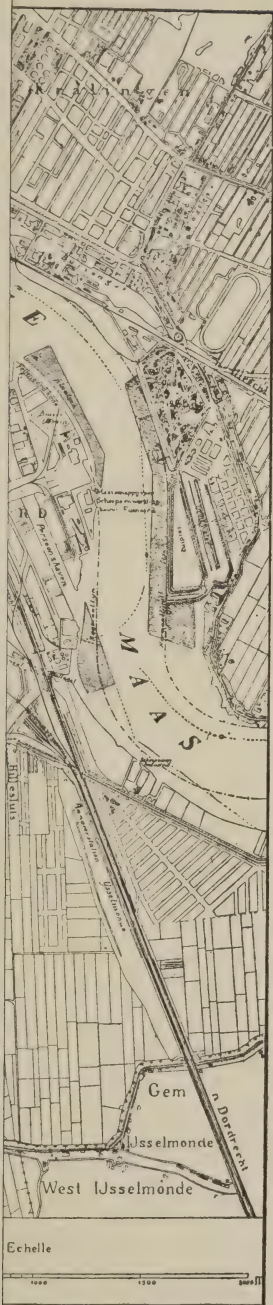
waterways is assuredly felt. Government recognizing that need, has appointed a Royal Commission to deal with this question. Before long Twente will probably be connected with the IJssel by means of a canal navigable for vessels of 600 to 800 tonnage.

ADMINISTRATION.

Last of all a few observations concerning the administration of the waterways. From the description of the ports of Amsterdam and Rotterdam, it has been seen that the ports are as a rule worked by the city corporations. Delfzyl however is an example of Provincial, the fishing port at IJmuiden of State management. The channels leading to the harbors and the principal waterways for inland navigation, are as a rule administrated and maintained by the State, whereas the minor canals fall under the administration of provinces, municipalities, "waterschap's" or private companies.

As a rule no dues are levied, or, if any, they are so insignificant as to scarcely hamper navigation. On all State waterways shipping is absolutely free. The vital importance of shipping to the country being obvious, it is not surprising that the Government has never hesitated in granting the sums required for the improvement of existing waterways or the construction of new ones, whenever the rapidly increasing development of traffic required it. From 1882 to 1912 the State has spent a total sum of f203.000.000 (\$81 2000.000) for this purpose. If the reader keeps in mind how small a country the Netherlands are, mentioning this sum will strengthen his impression which — it is to be hoped — the preceding pages have caused, that in the Netherlands traffic along the canals and rivers occupies a unique place, and that it is a most important factor in the development of this country.

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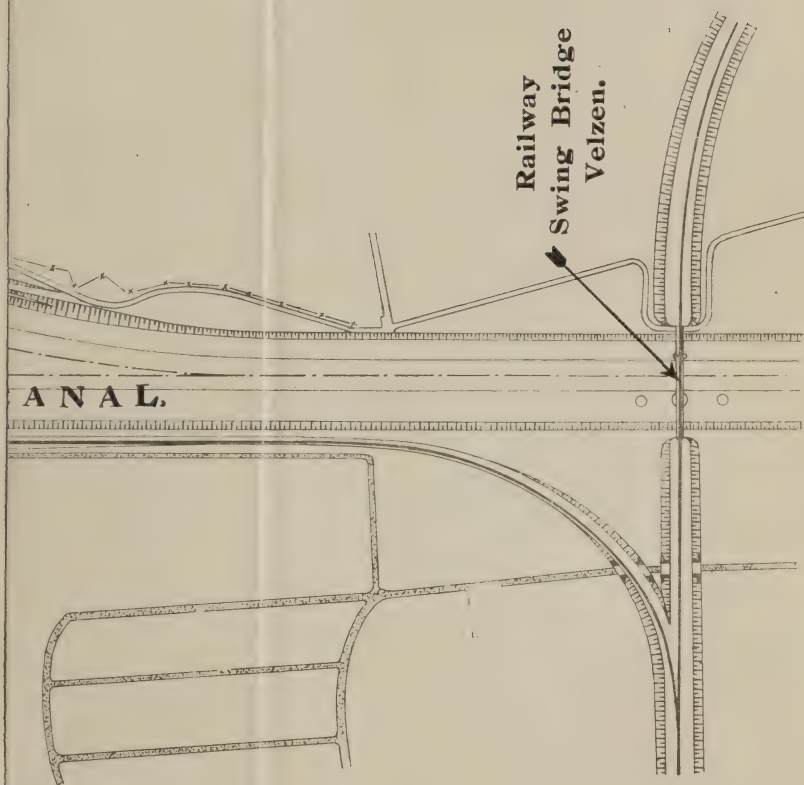
The Port of Rotterdam in 1910.

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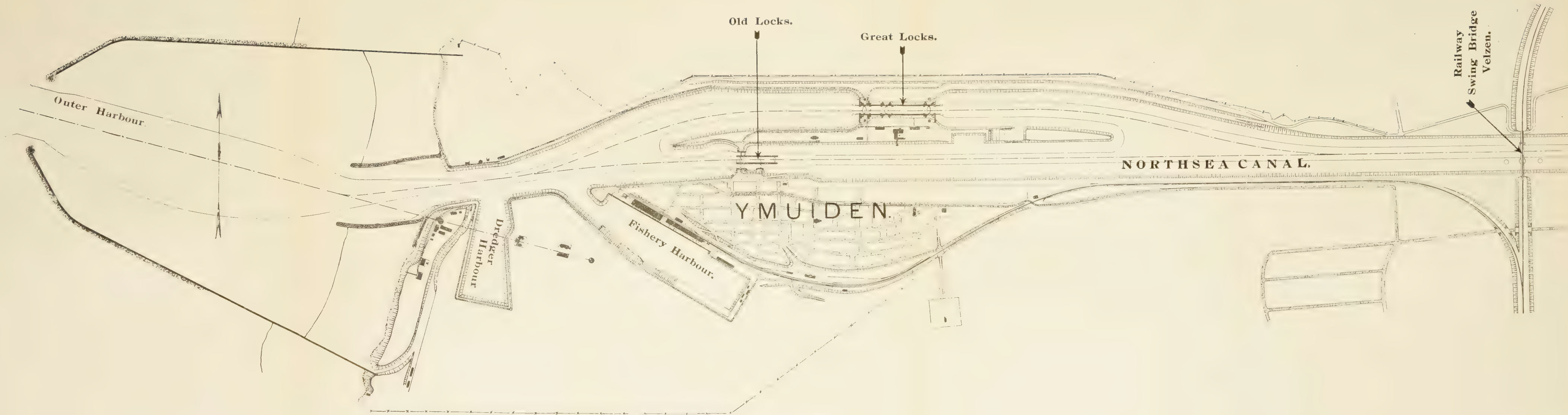
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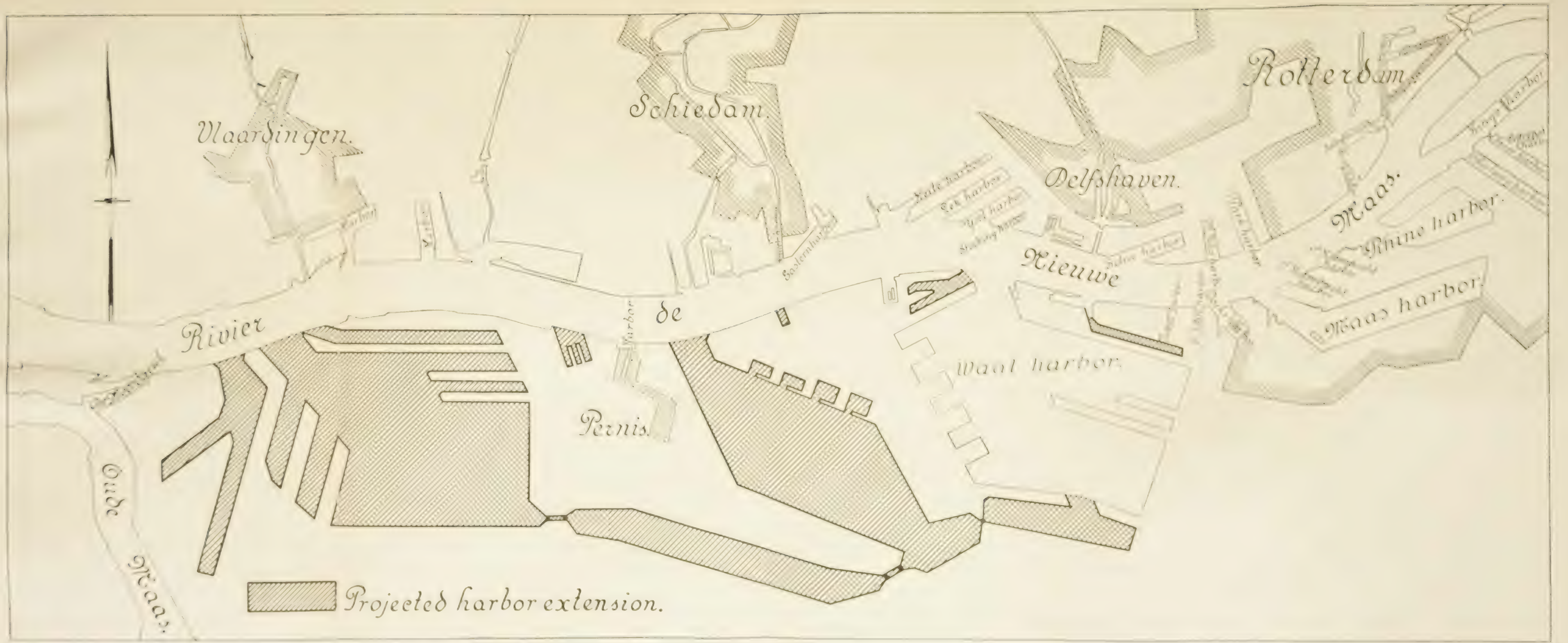
NORTH SEA.



Situation of the harbour works at Ymuiden.

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Vlaardingen.

Schiedam.

Rotterdam.

Delfshaven.

Maas.

Rhine harbor.

Maas harbor.

Nieuwe

Waal harbor.

Pernis.

de

Rivier

Oude

Maas.

Projected harbor extension.

WHAT TO SEE IN THE NETHERLANDS FROM AN ENGINEER'S POINT OF VIEW

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WHAT TO SEE IN THE NETHERLANDS
FROM AN ENGINEER'S POINT OF VIEW.

INTRODUCTORY.

For the benefit of his American fellow-engineers, the author will try to condense into five short chapters the matter of as many volumes. This naturally calls for a merciless handling of the pruning-knife. But the writer knows that the American mind is as fertile as the American soil, and as a lopped tree sprouts with the more vigour, so the natural genius of the reader will easily supply what is wanting.

Moreover, as this booklet is only intended to stimulate the reader to visit the Netherlands, more complete information might frustrate its purpose and, on the contrary, induce him to stay at home. ¹⁾

¹⁾ The author gratefully acknowledges the kindness of Mr. E. J. LABARRE, British Vice-Consul at Amsterdam, in correcting his English, and desires to thank Messrs. BOS, JOLLES, DE BLOCQ VAN KUFFELER, PENNINK, RAMAER and WORTMAN for revising data.

CHAPTER I.

HOW THE LAND WAS RECLAIMED.

1. Hydraulic Condition of Holland (*Waterstaat*).
 2. Origin of the Polders.
 3. The Conservancy Board (*Polderbestuur*).
 4. Drained Lakes (*Droogmakerijen*).
 5. A Peat Pit in Exploitation: the Bullewijker Polder.
 6. Significance of Amsterdamsch Peil (A.P. and N.A.P.).
 7. Drained Lakes near Rotterdam: Alexanderpolder and Zuid-plaspolder.
 8. Haarlem Lake Polder.
 9. Combination of Polders (*Waterschap*).
 10. Larger Combinations (*Hoogheemraadschap*).
 11. Rhineland (Rijnland).
 12. Infiltration of Water (*Kwel*): Bijlmer Lake, Bethune Polder, Naarden Lake, Betuwe.
 13. The Passing of the Netherlands Windmill: the Hercules Motor.
 14. Various Methods of Lifting Water (*Bemalingswerktuigen*), Settling and Sinking of the Soil.
 15. Scoop Wheels (*Schepraderen*).
 16. Automatic Electric Plant.
 17. Proposed Draining of the Zuyder Zee.
 18. Proposed Draining of a Part of the Zuyder Zee, called the Wieringen Lake.
 19. Parcelling (*Verkaveling*).
-

1. HYDRAULIC CONDITION OF HOLLAND (*Waterstaat*).

The attention of the reader is first directed to the hydraulic condition of that part of the Netherlands which the inhabitants have wrested from the sea.

About 3,000 square miles (almost the entire western portion of the Kingdom) lies below the mean high water level of the sea. It required the incessant labour of countless generations of Netherlandsers to change the fever-stricken fens and lonesome lakes into fertile pastures, world-famous

for their cattle-breeding qualities. Once the most desolate province of the Netherlands, Holland is now the most densely populated and the wealthiest. Its fame eclipses so entirely that of the other parts of the Kingdom, that to most foreigners Holland is synonymous with the Netherlands.

This change in the fortunes of Holland is the outcome of Netherlands hydraulic engineering. But not only the engineer will here find ample matter for instruction. The historian and the legislator will also reap a rich harvest of information in the Netherlands *polderland*.

The struggle against Spain (so brilliantly described by MOTLEY) and against LOUIS XIV of France (in the XVIIth Century) would not have ended in victories if the hydraulic condition of the country had not proved a most powerful and reliable ally to the feebly-armed Republic.

Hence it is not surprising that the rules which our forefathers laid down for the maintenance of the hydraulic status of the country, are still living law and scrupulously followed.

Waterstaat signifies literally "Hydraulic status or condition." *Rijkswaterstaat* signifies "Hydraulic status of the Kingdom." *Ingenieurs van den Rijkswaterstaat* (Royal Corps of the Waterstaat) are the civil engineers, in the service of the State, who control the general hydraulic condition of the Netherlands. In each of the eleven provinces a separate body of engineers supervises the hydraulic status in detail. They are called *Ingenieurs van den Provinciaalen Waterstaat*.

2. ORIGIN OF THE POLDERS.

The Roman author PLINY describes in the most vivid language the miserable condition of the first inhabitants of Holland. In his times no dikes kept the floods out; the natives housed on artificial knolls (Netherlands *pol* or *polle*, plural *pollen*) or on the top of low hills. Twice a day the environing plains were submerged. When the tide was in, their huts seemed to float, and they had the appearance of stranded vessels when the flood retired.

Christianity bringing civilisation, the inhabitants ameliorated their condition by embanking the land around their huts. Their dwelling on the knoll or *pol* naturally formed the centre of the reclamation, and this led them to give to the whole the name of *polder* (plur. *polders*¹).

At first only small tracts of land were enclosed, and many polders still cover only a few acres. Larger polders were gradually formed by combining smaller ones. (The original boundaries can often be traced). At last, emboldened by success, broader surfaces were embanked at one time.

3. THE CONSERVANCY BOARD (*Polderbestuur*).

By and by the Netherlands lowlands were covered by the present complete system of polders²). These still boast their time-honoured administration, presided over by a *Dijkgraaf* (lit. Count of the Dike), while the other members of the board are called *Heemraden* (lit. Homestead Councillors).

The Conservancy Board not only looks after the hydraulic conditions of the polder, but often takes charge of the roads. Sometimes seemingly incongruous tasks are laid on its shoulders — last vestiges of conditions obtaining in a period when no other political bodies were known on our soil. Even the choice of a *Dominee* (Protestant parish minister) is subject in some polders to the approval of the Board.

4. DRAINED LAKES — *Droogmakerij(en)* — lit. dried lake or pool; the word lake or pool, which completes the sense, being dropped.

These are the most interesting polders from an engineer's point of view. They are generally drained peat-pits, often of considerable area.

As fuel was always scarce in Holland, the inhabitants

¹) In the sequence the Netherlands plural will be indicated by brackets.

²) A vivid description of Netherlands polders and their products is given by Mr. J. W. ROBERTSON SCOTT, in *A Free Farmer in a Free State*. London, W. HEINEMAN, 1912.

were forced to delve for peat to burn. Peat was found in immense quantities to a considerable depth, in the stagnant waters eastward of the North Sea coast, which is formed by a row of sandy hills or dunes (Netherlands *duinen*). When all the peat was delved, and the subsoil laid bare, it paid to drain the pit, as the substratum was mostly fertile sea-clay. The new polder, formed in this way, only differs from those of earlier formation in its water-level lying on a lower plane. This made the draining more difficult, and formerly, when only windmills drained the polders, a number of these built in an ascending row often proved necessary; the windmill in the polder lifting the water to the level of the next windmill and so on, till at last the water was lifted to the level of the adjoining river.

5. A PEAT PIT IN EXPLOITATION: THE BULLEWIJKER POLDER.

A *droogmakerij* in formation may be visited in the proximity of Amsterdam. The Bullewijkerpolder near the village of Ouderkerk on the Amstel is being gradually changed into a peat-pit by the delving of the peat. This is done by machinery.

A certain sum per acre is laid aside in order eventually to defray the expenses of draining. The Government fixes this sum, and care is taken that this money, called *veengeld* or *slikgeld* (fen-money or mud-money), is properly administered. The money is deposited in instalments; nothing is paid if no peat is delved, but the total area must be stripped of peat within a certain number of years. Otherwise the ownership of the sub-soil would be of no value to the *ingelanden* (lit.: owners of land in the polder) who, having dug off their own peat, must await the clearing of the entire area before they can begin to exploit the subsoil.

6. SIGNIFICANCE OF AMSTERDAMSCH PEIL (AMSTERDAM LEVEL).

Before proceeding, it is necessary to explain that in the Netherlands, and also in adjacent parts of Germany, the

datum-plane or basis for the measurement of heights, is the mean high-water level at Amsterdam, as it was when the harbour on the Zuyder Zee was still in open communication with that sea (an inlet of the North Sea).

This level is called **Amsterdamsch Peil**, the mark being abbreviated: A.P. Some years ago it was observed that many of these marks, spread over the country, incorrectly indicated this plane, partly on account of disturbances in the subsoil, partly by carelessness in the renewal of wooden gauges. A general revision was therefore ordered, and now the new marks are distinguished from the old ones by the letters N.A.P. (New Amsterdam Peil or Level).

7. DRAINED LAKES NEAR ROTTERDAM.

The **Alexanderpolder** is a fair example of a *droogmakerij*. It was drained in 1874, and has an area of 7,370 acres. The water level is kept at $21\frac{1}{2}$ feet below N.A.P. Four centrifugal pumps lift the water to an intermediary canal, from which it is discharged into the river by one centrifugal pump. The annual expenses of the polder are \$ 1.94 per acre.

Near to it — also within easy distance from the town of Gouda — lies another remarkable *droogmakerij*, drained in 1839, called the **Zuidplaspolder** (polder of the southern lake) of an area of 10,285 acres, where the water level is kept at $19\frac{3}{4}$ ft. below N.A.P. The polder is drained by two plants: *beneden stoomgemaal(en)* (lit.: lower steam mills). These lift the water into an intermediary canal, drained by two other plants: *bovenstoomgemaal(en)* (upper steam mills). Formerly the lower steam mills were provided with Archimedean screws — *Vijzel(s)*. These are now replaced by horizontal plunger-pumps. In the upper steam mills scoop wheels are installed which discharge the water into the river. The annual expenses of the polder work out at \$ 1.78 per acre.

8. POLDER OF THE HAARLEM LAKE. (*Haarlemmer-meerpolder*).

This is by far the most interesting *droogmakerij*. (See plate I).

PLATE I.



In ancient times three small lakes existed near the town of Haarlem. These gradually merged into one, their banks — consisting of peat — continually eroding. The large lake became a constant danger to the enviroing country, as the erosive power of the waves increased with the broadening of

its surface. Between the 13th and the 19th century 19,200 acres were devoured by the *waterwolf* (a Netherlands word that needs no translation), so that the Government decided (in 1839) to drain the lake. This then assumed an oblong shape; its length being 14½ miles, its greatest width 6½ miles and total area 41,640 acres.

It was calculated that the draining of the lake and adjacent smaller surfaces, forming a total of 45,000 acres, by 114 windmills would cost a million dollars more than if the drainage were effected by three steam pumping plants of 400 I. H. P. each. The working expenses would also be heavier. Steam pumps were therefore installed, though pumping by steam on so large a scale was then a novelty.

An English firm contracted for the supply of three plants of 350 I. H. P. Each plant consisted of a vertical single-acting condensing engine of the Cornish type; this was placed in the centre of the engine room, and surrounded by a ring of vertical pumps, lifting the water 15½ feet. One plant still serves as emergency plant (it is called the CRUQUIUS, after a famous Netherlands engineer). In one of the others (the LYNDEN) the machinery was replaced in 1913 by two steam engines of 600 I. H. P., each working a centrifugal pump. Centrifugal pumps were recently installed in the third power house (the LEEGHWATER) which are driven by Diesel engines¹).

The lake was first surrounded by a drainage canal called the *ringvaart* (lit.: ring canal) in order to collect the water, which flowed freely into it from the surrounding country (dimensions: width 140 ft. on the surface, 95 ft. at the bottom, depth 10 ft.). The excavated soil (peat) served as an embankment on the inner side of the canal, to keep out the floods.

The bottom of Haarlem Lake lay 14 feet below N. A. P.

¹) A description, together with drawings of the old engines, is to be found in "*The Drainage of Fens and Low Lands*" by W. H. WHEELER, Spon, London & New York, 1888. Drawings of the new Lynden plant are given in the second volume of the Netherlands work: "*Polders en Droogmakerijen*" by A. A. BEEKMAN, the Hague, VAN CLEEF BROS, 1912.

The water level in the drained polder was fixed at $15\frac{1}{2}$ below N. A. P. It contained 602,800,000 metric tons of water. To this were added by rainfall and infiltration 189,000,000 tons during the period of draining. It took 39 months to drain the lake, but the pumps actually worked during $19\frac{1}{2}$ months only, the engines being often stopped for cleaning the valves, etc. The draining was finally completed in 1852.

The expenses (including roads, etc.) amounted to \$ 3,447,000, or \$ 76.75 per acre. This was more than double the estimate, but fortunately the drained land (fertile sea-clay) sold at higher figures than was expected, and left a deficit of only \$ 1,103,000.

At present the population of the polder numbers 18,000, and the State taxes easily make up the interest of that sum.

An exhaustive account of the vicissitudes of the polder during the period 1856—1906 was published by order of the Conservancy Board. At first the drains and ditches formed a storage basin (*boezem*, lit.: bosom) of only $\frac{1}{32}$ nd. part of the area of the drained land. This was insufficient to collect the rainfall and caused a rapid and injurious rising of the water in the ditches. The storage capacity has therefore been gradually increased to an area of $\frac{1}{20}$ th. part of the polder surface.

The annual expenses of the draining of the polder are \$ 1.46 per acre.

9. COMBINATIONS OF POLDERS [*Waterschap(pen)*].

In this almost level country the same main drain, or ancient river, often serves as an outlet for a number of polders. The same substantial dike also frequently protects a number of polders against the sea or the river floods. This community of interests led to a special form of corporation, called *waterschap(pen)* (obsolete word, originally signifying drain, but at present applied to the corporation which takes care of the common drain or dike).

While the general interests of the combine are cared for by the Waterschap or Conservancy Board, the special

hydraulic requirements of each polder are attended to by special polder boards.

10. LARGER COMBINATIONS [*Hoogheemraadschap (pen)*]: lit., High Homestead Councillors' Corporation].

This is the title given to the most important combinations of polders. The President of the Board (*Dijkgraaf*) is appointed by the Queen, which is also the case with the Presidents of *Waterschappen*, whose dikes defend the country against the floods of the principal rivers or against the sea.

Formerly these high and mighty Boards enjoyed extensive powers, and their gallows, whipping posts and pillories adorned the dikes in an ominous fashion. The Revolution of 1795, however, swept away those implements of rather arbitrary justice. The lower judicatory functions were retained by the Boards up to 1841. At present infractions of the by-laws, *keur(en)*, made by the *Hoogheemraadschappen*, are tried by the ordinary courts. And these corporations, once so powerful, are reduced to imposing fines of not more than ten dollars and imprisonment not exceeding three days. Even in order to inflict these small penalties the Board must call in the aid of ordinary justice. The criminal law of course now provides against the graver offences formerly punished by the *keuren*.

11. HOOGHEEMRAADSCHAP RIJNLAND (RHINELAND because formerly the Rhine flowed through it).

This is by far the most important combination of polders. The Haarlem lake forms part of it. The combination is formed of two hundred and twenty-two polders, with an area of 190,763 acres. Of this area, 80,000 acres are still drained by wind-mills. Within its limits are found the towns of Haarlem, Gouda and Leyden.

The polders discharge their water in the main drains of the combination. These form a storage basin of 6,520 acres (including the pools, lakes and ditches, which are in open communication with such drains). This basin discharges its waters by gravitation through outlet-sluices located at four

points of its circumference. When the natural outflow is stopped, pumping engines take over the task. An almost constant water level is maintained in the basin, which only varies between 1 ft. 10 in. below N. A. P. and 2 ft. 3 in. below N. A. P. The pumping is effected by means of scoop wheels, as these are generally preferred to centrifugal pumps when the lift is small, as is the case here.

The four pumping plants have a total capacity of 1,335 I. H. P. The most powerful plant is situated at Katwijk on the North Sea (near Leyden). It is seldom used, as it comes cheaper to discharge the waters in the North Sea Canal near Amsterdam, the Government being obliged to maintain a low water level on that canal.

Rhineland discharged in 1913, 155 million tons of water by gravitation, and 338 million tons by pumping. This was a normal performance, as the total rainfall in that year amounted to 2 ft. 3½ in., which is a fair average. The previous year (1912) 802 million tons had to be discharged, the largest quantity for many years. In summer, fresh water is drawn from the River Ysel near Gouda, in order to replenish the drains and ditches, as evaporation lowers the water level too much in the polders.

In 1911, an excessively dry year, 197 million tons of fresh water were drawn from the River Yssel.

The annual expenses of upkeep of Rhineland are 27 dollar cents per acre. This is rather a small sum, but each polder also pays its private expenses. These vary with their hydraulic conditions. Some disburse less than 30 cents per acre; in *droogmakerijen*, however, the annual expenses amount to almost \$ 4 per acre.

12. INFILTRATION WATER. (*Kwel*, i. e. well, spring).

The cost of draining the infiltration water often proves a heavy burden upon *droogmakerijen*. For instance, in the polder of **Bijlmer Lake** (near Amsterdam) the *kwel* amounts to ten times the rainfall. (Area 1,359 acres). The **Bethune droogmakerij** near Utrecht was in an even worse condition. The subsoil being extremely porous, it

automatically drained the surrounding older polders, with a surface ten times its own. The discouraged proprietors of the *droogmakerij* decided to abandon the work, but the neighbours preferred to extend a helping hand, and now pay part of the expenses of draining.

Most melancholy is the story of **Naarden Lake** (near Amsterdam). This lake of 1,482 acres was drained in the 17th century. Shortly afterwards the country was threatened with a Franco-German invasion, and the drained area forming part of the defence system, it was flooded again. It remained in this condition till 1883, when a new company drained the lake at the cost of \$ 87,500.

The trials of the old company were imperfectly known, otherwise the new one would have been less surprised when the bottom of the drained lake proved to leak like a sieve (only in the wrong direction) and let in the subterraneous water. The cost of maintaining the drainage proved excessive and the works were abandoned. The Society for the Preservation of Monuments of Nature bought the lake just in time to prevent Amsterdam from using it as a dumping ground. It now serves as a breeding place for wild waterfowl.

The *kwel* naturally varies with the conditions of the subsoil. Polders adjoining rivers suffer from it when the floods are high. An instance of this is seen in the island formed by the two branches of the Rhine, called the **Betuwe**. It is surrounded by dikes with a total length of 111 statute miles. Two tons of water per running foot of dike enter the Betuwe subterraneously in twenty-four hours, when the level of the river rises to 8 feet above the level in the drains. In some parts of the Betuwe this rate is even doubled.

In the Haarlem Lake polder the *kwel* is rather small. Only one ton of water per running foot of dike, which is under a constant head of water of 14 ft. 10 in., enters the polder in twenty-four hours.

The *kwel* generally decreases in course of time. The subterraneous veins are choked up with the mud and sand which the water carries.

13. THE PASSING OF THE NETHERLANDS WINDMILL: THE NEW HERCULES MOTOR.

The typical Netherlands windmill is fast passing away. No new ones are built, and the art of constructing these intricate wooden engines is almost lost.

The windmill of the ordinary type costs about \$ 10,000. It develops $11\frac{1}{5}$ W.H.P. (Water horse-power measured in water actually lifted). It is estimated that one windmill suffices for draining 1,235 acres, when the lift is 4 ft. 2 in. However, as the wind blows with sufficient strength during 1,440 hours a year only, it is not always possible to maintain the desired water level.

Wind motors of the ordinary American type were introduced, but could not resist the strong gales which often blow here. At present some sixty German Hercules motors — a heavier type — are successfully used for the draining of small polders in the northern provinces, Friesland and Groningen. For this purpose these motors are coupled to Archimedean screws.

In this case screws, *vijzel(s)*, are preferred to scoop-wheels, because the ratio of efficiency is almost constant, although the velocity of the motor varies. A good specimen of a Hercules motor is to be seen at Ulrum, a place not far from the town of Groningen. It drains 1,934 acres — rather a large surface for one mill, but the conditions are favourable, and the cost (including pile foundation) is \$ 6,000.

14. VARIOUS METHODS OF LIFTING WATER [*Bemalingswerktuig(en)*, lit. draining engines]. SETTLING AND SINKING OF THE SOIL.

As a rule the old Netherlands windmill was coupled to an Archimedean screw. When the lift was small, scoop-wheels were also used. When steam was introduced, it only caused an increase of dimensions. Gradually, however, the centrifugal pump came into favour and now generally prevails.

One of the many reasons for its being preferred, is the ease with which the centrifugal pump accommodates itself

to permanent changes in the water level of the polder. In *droogmakerijen* and even in ordinary polders, the soil settles, becoming more compact by draining. This leads to a permanent lowering of the water level in the polder.

In the **Beemsterpolder** (a lake drained in 1612) the water level was lowered in 1632 one foot, in 1694 again $\frac{1}{2}$ ft, and in 1847 another $\frac{1}{2}$ ft, or in all 2 ft.

The sinking of the subsoil by geological process also causes some trouble. Fortunately this process is very slow. In the last six centuries the Zeeland polders have subsided three feet ($\frac{1}{2}$ ft per century). This seems to be the actual rate of the sinking of the Netherlands coast, as calculated by M. RAMAER, an Engineer of the Royal Corps of the Waterstaat. (Transactions of the Netherlands Institute of Civil Engineers, 1907/08).

15. SCOOP-WHEELS [*Scheprad(eren)*].

A fair example of a Government scoop-wheel plant is found near Amsterdam at Schellingwoude, on the Zuyder Zee. (Small steamers ply hourly from Amsterdam to Schellingwoude). The plant consists of three wheels of 28 ft. diameter and 10 ft. broad. The quantity of water lifted in 24 hours is 770,000,000 gallons, when the lift is 4 ft., and 440,000,000 gallons when the lift is $7\frac{1}{2}$ to $8\frac{1}{2}$ ft. Ratio $\frac{W. H. P}{I. H. P.} = \frac{640}{900}$.

A more recent Government plant on a smaller scale is found near Keizersveer. (A branch line of the railway from Rotterdam to Breda passes the town of Geertruidenberg, from which it is easily reached on foot). In 1897 extensive reliability trials were made by M. JOLLES of the Royal Corps of the Waterstaat. The following figures are extracted from a paper published in "*de Ingenieur*":

Pumping Engines of the Southern Canal.

Greatest diameter of the wheel	24 ft. 7 in.
Width of scoop	8 ft. $2\frac{1}{2}$ in.
Mean dip of scoop	4 ft. 8 in.
Mean lift.	3 ft. 8 in.

Mean number of revolutions of tandem-engine per minute	54
" " " " " wheel	4
(this proved to be the most favourable speed per minute)	
Quantity of water lifted per minute	276 metric tons.
Ratio $\frac{\text{horse power water lifted}}{\text{horse power gross indicated}} =$	58 1/2.
Coal consumed per W. H. P. per hour	36 1/3 lbs.
Total cost of plant	\$ 45,000.

16. AUTOMATIC ELECTRIC PLANTS.

The visitor to Keizersveer can at the same time easily inspect the Government electrical pumping plants on the River Donge.

Some years ago the Government dammed the river Meuse (Maas) near Woudrichem, where it mingled its waters with those of the principal branch of the Rhine (Waal). A new outlet for the Meuse was dug from the town of Heusden to the town of Geertruidenberg and named Bergsche Maas. The hydraulic condition of the environing polders was completely altered by this deviation. A great number of them, which formerly discharged their water freely by gravitation, were now unable to do this, and the Government was forced to put up, and to maintain, a large number of pumping plants at its own expense.

The polders near Geertruidenberg on the river Donge are small and not inhabited, as their levels do not keep out the more important floods. Their only produce is hay. These polders are isolated by tiny tidal streams, which together form the river called Donge. These peculiar conditions made it necessary to drain each polder separately, and as the installation of so large a number of complete pumping plants, with residences for attendants &c., would have proved expensive, it was decided to erect automatically working centrifugal pumps, driven by electricity. A central electric power station supplies the current required.

Each pump starts automatically when the water level in its polder surpasses a certain mark, and it also stops automatically when the water has fallen to its former plane. Thirty-two pumps drain as many polders (a total area of 9,240 acres :

the area of the largest polder is 2,005 acres, and of the smallest 25 acres). The pumps are of the Neukirch type (a German patent), and deliver 213 tons of water per minute. The installation cost \$ 119,400 (including the steam generating plant, the electrical transmissions and the buildings).

The ratio $\frac{\text{water horse-power}}{\text{gross indicated horse-power}} = 50 \text{ to } 60 \%$ with a lift of 4 ft. 11 in. to 6 ft. 7 in.

A similar combine of 23 pumps, delivering 243 tons of water per minute, was soon afterwards erected by the Government on the northern side of the Bergsche Maas.

17. PROPOSED DRAINING OF THE ZUYDER ZEE.

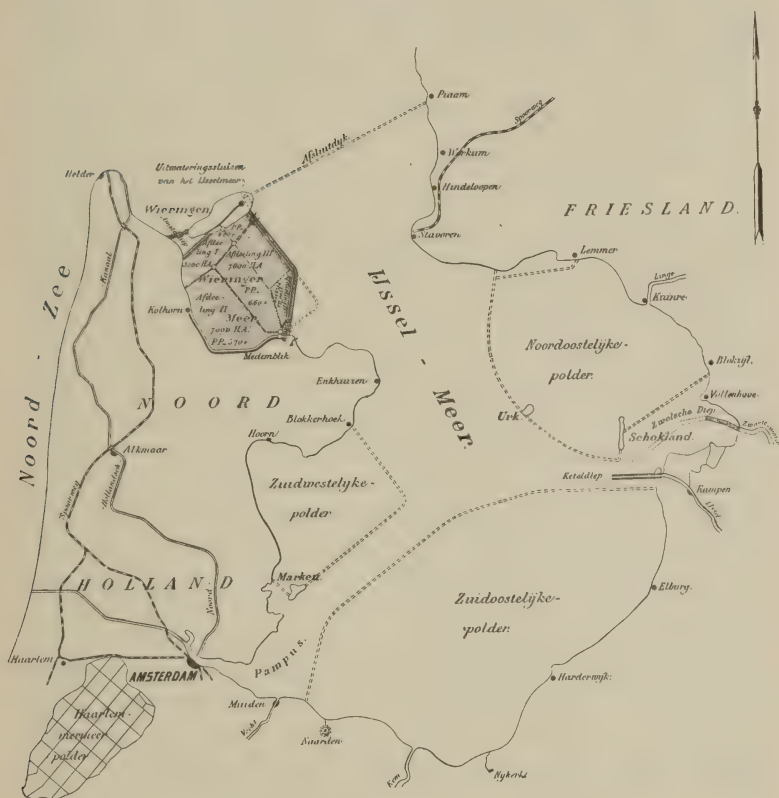
The draining of this large gulf of the North Sea has engaged the attention of Netherlands engineers for half a century or more. A great many plans were brought forward, and some were almost commenced upon. The most recent plan was prepared by Dr. LELY, the present Minister of the Department of Waterstaat. This scheme (Plate II) embraces the greater part of the Zuyder Zee. It differs also from former projects by considerably enlarging the proposed lake in the northern part and feeding it with fresh water (358,150 acres). This will prove of great benefit to some of the enviroing provinces, which at present suffer much from summer droughts. In former schemes the river Ysel ¹⁾ (a minor branch of the Rhine) was shut out; now it will supply the fresh water lake. This lake will be located in the northern part, where the bottom of the sea consists of sand, which is of far less agricultural value than the sea-clay, which forms in other parts the bottom of the Zuyder Zee.

According to Dr. LELY's project, four polders will be formed, having a total area of 494,000 acres. Some years ago this plan was approved by a Government Commission, which introduced slight modifications. Part of this project was embodied in a Bill, which a change of Ministry, however,

¹⁾ There is another river Ysel (mentioned on page 14) which flows through the Netherlands; it is of small importance.

caused to be dropped: Dr. LELY now being again in power, this Bill will once more be presented to the Chambers, after the project has been brought up to date.

PLATE II.



The costs were estimated at \$ 53,250,000 or at \$ 81,500,000 if compound interest (on a $3\frac{1}{2}\%$ basis) is added to the outlay. The first polder will be saleable in the 17th. year after the commencement of the undertaking, the fourth in the 36th. year.

If sold at \$ 262 per acre, the expenses will be entirely covered. They will probably make this price.

The enclosing dike or dam, running across the Zuyder Zee from the western coast of the province of Friesland to the eastern border of North Holland, will measure $18\frac{1}{4}$ statute miles. (Estimated cost: \$ 7,030,000. Including the outlet sluices, etc., \$ 10,125,000). Its construction will take nine years.

(For further particulars see the next chapter).

18. PROPOSED DRAINING OF A PART OF THE ZUYDER ZEE, CALLED WIERINGEN LAKE.

With a view to acquiring experience in the reclamation of the Zuyder Zee, a former Ministry, in a Bill presented in 1907, suggested the draining of one of the above-mentioned polders. (The great dike across the Zuyder Zee was omitted in this project). The polder, situated between the coast of North Holland and the island of Wieringen, would cover 40,590 acres of saleable land, costing \$ 348 per acre — or with compound interest added, \$ 425 per acre — which would also be its selling value. The annual expenses were estimated at \$ 2.09 per acre. It would take four years to construct the enclosing dike ($10\frac{1}{2}$ miles, at \$ 425 per running foot) Five steam pumping plants (2,125 W. H. P. at a cost of \$ 563,000) discharging the water directly into the Zuyder Zee, would drain the polder in three years. The water level of the polder was to be fixed at 23 ft $7\frac{1}{2}$ in. below N. A. P. The engines were calculated in accordance with the customary rule that twelve water horse-power can drain 2,500 acres, when the water is to be lifted not more than three feet.

Three years after the completion of the draining, the land would be ready for sale. Some time must then elapse before the soil is solid enough for digging ditches and tracing roads. This work is called parcelling.

19. PARCELLING (*Verkaveling*).

The parcelling out of Wieringen polder was carefully planned by a commission of well-known experts, and differs

from former parcellings in so much as the proposed plots were reduced to half the usual size. Wieringen polder was to be divided into rectangular divisions of a length of 2,186 yards, and of a breadth of 1,093 yards, by a system of main-roads, *hoofdweg(en)*, and country roads, *landweg(en)*. All these roads were to be metalled (macadamed).

Each plot, *kavel(s)*, was to be quartered ($546\frac{1}{2}$ yds $\times$ $546\frac{1}{2}$ yds) by a main drain or canal, *hoofdtocht(en)*, running parallel to the main road, and a cross drain, *kruistocht(en)*, running parallel to the country road; each of these subdivisions in its turn to be halved by a ditch, *sloot(en)*, running parallel to the main drain.

On either side of the roads ditches were to be dug, and every plot would also be divided by a ditch running parallel to the other ditches. In the Netherlands subterraneous draining is scarcely ever applied; open drains are preferred, as they also augment the capacity of the *boezem* (bosom: the emergency storage basin). This basin is of great importance, especially in polders with small pumping power, where otherwise a heavy rainfall would raise the water level in the ditches to an undesirable level ¹).

The parcelling-out proposed by the commission of experts, is shown on plate III. Principal dimensions: main roads $39\frac{1}{3}$ ft., country roads $29\frac{1}{2}$ ft., main drains or canals (measured at the water level) $40\frac{1}{3}$ ft., depth 6 ft. 11 in., slopes $1\frac{1}{2}$: 1. Cross drains: 29 ft. 2 in., depth 4 ft. 3 in., slopes $1\frac{1}{2}$: 1, ditches $6\frac{1}{2}$ ft., depth 3 ft. 3 in., slopes $\frac{3}{4}$: 1. Total emergency storage capacity 4.3 % of the total polder area.

As the draining of a larger part of the Zuyder Zee is now again being considered, this Wieringen scheme was dropped.

¹) Formerly the pumping capacity was considered sufficient when the pumps could keep ahead of a daily rainfall of $2\frac{1}{3}$ in. As a matter of fact such delicate crops are now cultivated as demand a more constant water level, so the pumps must be able to keep ahead of a rainfall of 4 inches per day.

PLATE III.



Fig. 1.

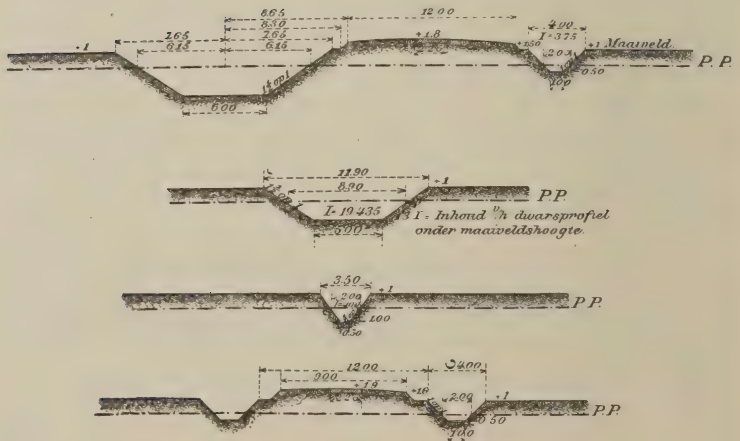


Fig. 2.

Taken from the work:
BEEKMAN, Waterbouwkunde. Published by Gebr. van Cleeff, The Hague

CHAPTER II.

DIKES AND DEFENCES AGAINST THE SEA.

1. River Dikes.
 2. Wells, *wel(ten)*; Why Dikes Subside; the Floating Sand in Zeeland Causes a *Dijkval* (fall of the dike).
 3. Defence of the Slopes.
 4. Sea Dikes: Petten Dike (Hondsbossche) near Alkmaar; Westkappel Dike near Flushing.
 5. System DE MURALT.
 6. Groynes or Sea Dams at Scheveningen, near The Hague.
 7. The Proposed Dam in the Zuyder Zee.
-

1. RIVER DIKES.

As was pointed out in the first chapter, Netherlands dikes date from time immemorial. Their cross-section has, however, undergone many changes in the course of centuries. Formerly the floods were kept out more easily than is the case at present. In ancient times the German Rhine, when rising above its banks, flooded large tracts of land, which thus acted as a temporary storage basin. At present the German portion of the Rhine is well defended by levees, and the floods speed seawards as in a gutter. It was eventually found necessary to raise the crest of the Netherlands dikes and at the same time to augment their dimensions. A cross-section of the most important river dike in the Netherlands is shown on plate IV. The changes in profile and height effected in course of time are clearly shown.

This cross-section is taken at Vreeswijk on the Rhine (near Utrecht), where the canal to Amsterdam (called Merwede Canal) branches off from the Rhine, which in its lower course is called Lek. This dike is of vital importance. If a breach occurred near this spot, five hundred thousand acres

PLATE IV.

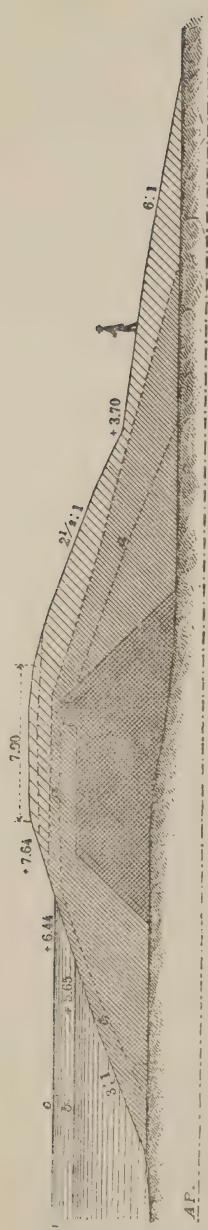
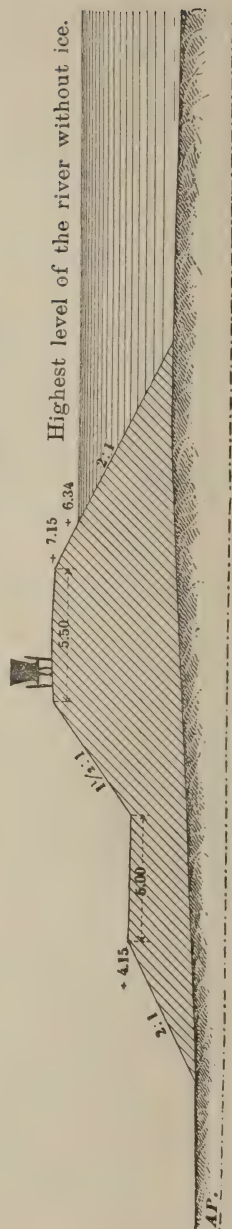


Fig. 1.

Dike on the River Lek near Vreeswijk.

- Shaded cross-hatched: dike in 1751.
- Finely shaded: dike in 1879.
- Grossly shaded: reinforcement of 1880.
- Very grossly shaded: reinforcement of 1884.
- a—a—a. reinforcement proposed in the 18th century.
- b. highest river level observed in 1751.
- c. highest river level observed in 1885.



Dike on the river Lek near Vianen.

Fig. 2.

would be flooded, and eighteen cities and 180 villages would suffer more or less (Utrecht, Amsterdam, Leyden, etc.). The only compensation would be the thorough scouring of the canals, *gracht(en)*, of Amsterdam. This was the case in 1747, when the country was flooded for the last time. Fortunately the damage done was small, as the river subsided shortly after.

The cost of keeping dikes and levels in a state of repair, falls on the adjoining polders and is controlled by the Province and the State. These can order works, if judged necessary, and even execute them at the expense of the land-owners, if the Conservancy Board of the polder delays in obeying orders.

In autumn ample material is stored along the dike for raising coffer-dams, *kisting(en)*, on its crest, if necessary. When the floods rise above a certain mark, the Conservancy Board stations sentinels on the dike, and the Government orders the engineers of the Rijkswaterstaat (see Chapter I, 1) to reside temporarily in the towns and villages adjoining the river. These report daily to the Government, a special letter carrier collecting these reports and those of the polder board. This is called river correspondence (*rivier-correspondentie*). The same precautions are taken in spring, when the ice breaks up.

The law gives the polder board and the State engineers full power to act in cases of emergency. They are authorized to demolish dwellings, when bricks or other materials are required for filling breaches or stopping the wells, which spring up near the inner toe of the dike.

2. WELLS [*wel(len)*].

If the floods last, the dike becomes soaked, and the pressure of the river water causes the formation of small veins of water in the body of the dike. The material of which the dike is built (generally sandy clay) is easily carried away; the veins widen, and at last a well springs up, generally near the inner toe of the dike. This is considered dangerous, especially if much sand is thrown up by the well, as

this indicates large veins, and the hollowing out of the dike. It often happens that the crest of the dike suddenly subsides, and unless precautions are taken (by raising the crest temporarily by means of coffer-dams, etc.) the flood overtops it and the whole body of the dike is carried away.

If feasible, large masses of gravel are thrown on top of the wells. In this manner the veins are prevented from carrying away the sand, as this gravel forces the water to flow more slowly. For the same reason all the ditches near the inner toe of the dike are filled up, and the inner slope of the dike is weighted with clay in order to compress the water veins.

The crest of the dikes generally serves as a roadway, and is metalled. This facilitates the transport of materials to the imperilled spots. By the constant passing of heavy conveyances the dike itself is compressed to a solid mass. The crest of the dikes having been gradually raised in the course of centuries, each layer is in this way firmly trodden in. This explains the extraordinary solidity of Netherlands dikes. They seldom give way, even when thoroughly soaked by lasting floods, provided only the subsoil (*staal*) is firm enough to support the weight of the water-laden mass.

In some parts of Zeeland, the subsoil is very treacherous. Thin layers of loose sand, called *drijfzand* (floating sand) often cause great damage. Under certain hydrostatic conditions this sand suddenly slides into the river, and then a large part of the dike sinks below the water level. Such an occurrence is called a *dijkval* (fall of the dike).

This only occurs on the tidal rivers of Zeeland, which are, properly speaking, inlets of the sea.

3. PROTECTION OF THE SLOPES.

The outer slope of river dikes is generally unprotected. The grass-grown surface forms a sufficient protection when the slope is a gradual one (the most important dikes have a slope of 3 : 1). Grazing on the slopes is forbidden.

When the floods are expected to damage the slopes,

they are protected by a temporary matting of straw or of brushwood, covered with bricks.

4. SEA DIKES.

The Netherlands sea dikes are for the greater part to be found in land-locked inlets, and nature favours the country by protecting its coast line (171 miles) by a fringe of sandhills or dunes, *duin(en)*. These rise with an easy slope from a broad sandy beach, on which the waves break without causing damage.

This natural protection is wanting only in the island of Walcheren near the village of **Westkapelle**, in the south of the country, for a distance of 4,100 yards (Westkappelle dike), and in the north of the province of Holland, near the village of Petten, over a length of 6,000 yards (**Petten dike**).

Petten is easily reached from Amsterdam by taking the railway to Alkmaar. Westkappelle can be visited from Flushing (Vlissingen) or Middelburg. The two dikes have many points in common; it will therefore be sufficient to describe the *Pettemer Zeewering* (Petten Sea Defence).

This dike consists of loose sand; the crest rises to $19\frac{3}{4}$ ft. above the ordinary high water level (indicated by the letters: V. Z. *vol zee*, full sea). The outer toe is protected by a layer of carefully set stones, from 5 feet below V. Z. to $7\frac{1}{3}$ feet above V. Z. with a slope of 4 : 1 (see plate V). Parallel to the toe, three rows of oaken stakes are driven into this slope in order to break the force of the waves. Next comes a grass-grown berm of clay, $98\frac{1}{2}$ ft. broad, sloping 40 in 1. This berm forms the basis of the dike proper. The dike has an outward slope of 5 : 1, covered with a facing of carefully set stones, to $16\frac{1}{4}$ ft. above V. Z.

One quarter of the length of the Petten dike belongs to the Government, and the other three quarters of it are maintained by the Conservancy Board of the *Waterschap* called the "Hondsbosche". Here the protection slightly differs from the above given description. (See also plate V).

At Westkapelle the same system is applied. The waves

Fig. 1.

Cross Section of Petten Sea Defence maintained by Government.

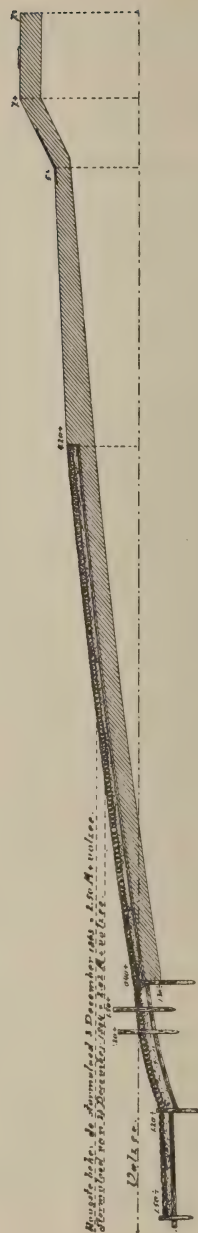


Fig. 2.

Maintained by the Conservancy Board of Hondsbossche.

there have a greater destructive force, the sea being deeper near this coast: hence the stone casing is of heavier construction.

5. SYSTEM DE MURALT.

Much attention is now paid to defence works of concrete, especially since Jonkheer DE MURALT (formerly

PLATE VI.



Fig. 1.

Defence Works of Concrete.

engineer to the island of Schouwen) began his experiments with this material.

In 1913 Jhr. DE MURALT published a profusely illustrated pamphlet in which he describes his numerous inventions ¹⁾.

¹⁾ *Dijk- en oeverwerken.* (Defence Works on Dikes and Coasts.)
I. WALTMAN JR., Delft, 1913.

PLATE VI.

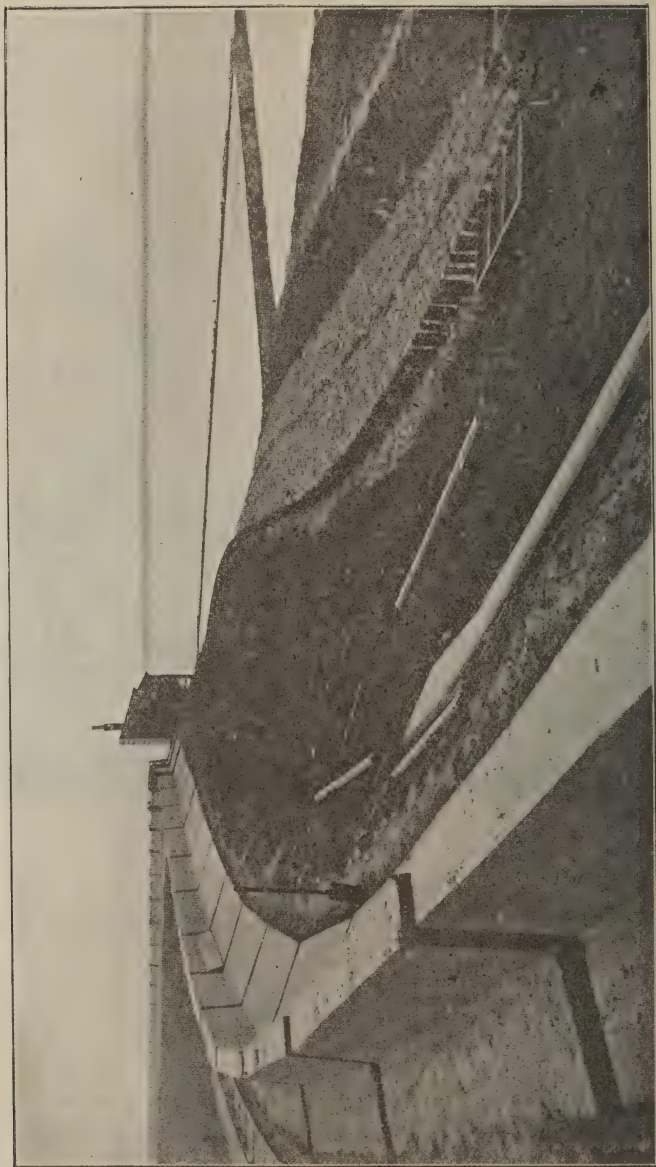


Fig. 2

In Zeeland recent floods have shown that the crest of many sea dikes was too low. The most economic way of raising the crest proved to be the forming of a concrete shield or screen on the top of the dike. This invention by JHR. DE MURALT is shown on plate VI, fig. 1. When travelling from Flushing to Rotterdam, a long stretch of dike where this system has been applied, will be seen on the left hand, near the station of Vlakte. The raising of the crest by $3\frac{1}{3}$ ft. costs \$ 1.34 per running foot. When the crest is to be raised $5\frac{3}{4}$ ft., the cost amounts to \$ 2.44 per running foot. Attention is called to the fact that wages are lower in the Netherlands than in the States. At Amsterdam, for instance, a bricklayer earns 14 to 19 dollar cents per hour, a carpenter 13 to 14 dollar cents. The working hours are 50 per week.

JHR. DE MURALT's system for protecting the outward slopes of dikes is also shown on plate VI, fig. 2. The concrete slabs are formed on the spot. They are kept in position by overlapping transverse beams of armoured concrete. The seams between the slabs are filled with asphalt. (Cost approximately \$ 1.33 per square yard).

On less exposed spots, slabs of concrete are laid down and kept in place by concrete bolts (plate VII).

A recent invention by Jhr. DE MURALT aims at doing away with the world-renowned and widely-used Netherlands mattresses of brushwood. It is superfluous to describe these mattresses of brushwood, as they are well known in the States ¹⁾.

The mattresses devised by Jhr. DE MURALT consist of quadrangular concrete slabs measuring 3 ft. 2 in, and 5 to 6 inches thick, and weighing 550 to 660 lbs. apiece. They are armoured. An iron loop protrudes at each corner. The four loops of four adjoining slabs are screwed down together by an iron bolt. The upper end of this bolt is eye-shaped.

When the mattress is ready (breadth $19\frac{3}{4}$ ft. to 46 ft ,

¹⁾ A detailed account of Netherlands mattresses is found in the Report on the North Sea Canal of Holland and the improvement of navigation from Rotterdam to the sea, by brevet Major-General J. G. BARNARD (Professional Papers of the Corps of Engineers, U. S. ARMY, 1872, No. 22).

PLATE VII.

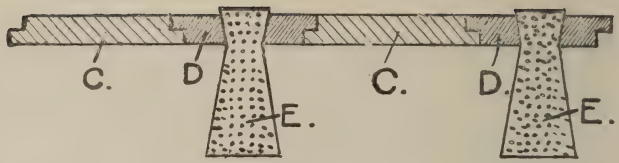


Fig. 1.

Defence Works of Concrete.



Fig. 2.

length generally 72 ft.) two pontoons are floated over it at high tide. These coupled pontoons rest on a temporary framework when the tide subsides, and do not touch the mattress. As many sheaths are spared in these pontoons as the mattress possesses slabs. Through each of these sheaths a steel cable is lowered, ending in a hook. This hook catches the eye of the iron bolt at the corner of the slabs. When the tide comes in, the pontoons are floated to the spot where the mattresses are to be sunk. The inventor estimates the costs of these mattresses to be $\frac{2}{3}$ of the cost of ordinary mattresses. (These cost about \$ 1.33 per square yard). Opinions differ widely as to the desirability of these concrete mattresses. The time elapsed since the first application of the method is too short for a definitive verdict.

The Royal Netherlands Institute of Engineers awarded the Conrad Medal to Jhr. DE MURALT for his many inventions.

6. GROYNES OR SEA DAMS. [*Hoofd(en)*].

To protect the sandy beach on the North Sea coast of the Netherlands from the action of the tides, groynes or sea dams have been constructed at fixed intervals. The tidal currents run parallel to the coast, and are rather feeble. The flood current, coming from the Channel, has a maximum velocity of 3 ft. per second. The ebb current is still weaker. These velocities however suffice (in combination with strong south-westerly gales) to gradually erode the sandy beach, which consists of extremely fine sand. The groynes are made of brushwood, carefully covered with a layer of stones. Of late years concrete has also been applied, and specimens of it are to be found near Petten, while at Scheveningen (near The Hague) the visitor will find ample occasion to study the ordinary brushwood construction. A detailed account of the Netherlands shore and its protection is found in *Stranden en Strandverdediging* (Coasts and their Defence), by Dr. WENTHOLT, Eng. R. C. of the Waterstaat, WALTMAN, Delft. (A copy of this work was presented to the Am. Soc. of C. E.).

7. THE PROPOSED DAM IN THE ZUYDER ZEE.

Plate VIII, fig. 1, illustrates the cross section of the dam projected across the Zuyder Zee, which plan was approved in 1894 by the Committee appointed by the Government to report on the drainage of this inlet of the North Sea.

In the first place an artificial island will be dumped midway between the coast of North Holland and the coast of Friesland. This island will be provided with harbours for the working craft. The dam will then be started simultaneously from both sides of the island and from the two coasts. First a small dam made of brushwood mattresses will be sunk. When raised over a certain length above ordinary high water level, powerful suction dredgers will form the body of a more substantial dike and raise the crest to $8\frac{1}{4}$ ft above the highest floods known.

Eastward and westward of the island two gaps are to be left in the dikes (each of which is 9,000 yards long) and through these gaps the waters of the southern basin will be discharged when this is filled by northern storms, flooding the low crested brushwood dams. Finally, the gaps are to be closed by means of brushwood mattresses.

This method of closing a dam or dike is usual in the Netherlands, but requires great foresight and skill.

Another method has been proposed by a Committee of eminent engineers and contractors, whom a society formed to promote actively the drainage of the Zuyder Zee had invited to reconsider the construction of this dam. The Committee proposes to use concrete caissons.¹⁾ (See Plate VIII, fig. 2). In the two gaps, to be left in the Zuyder Zee dam, a row of caissons will be placed at intervals of about the length of the caissons. These caissons are 164 feet long and $16\frac{1}{2}$

¹⁾ Iron caissons filled with concrete were recently used with great success at Scheveningen harbour. An illustrated description of these caissons is found in the paper of Mr. WORTMAN, Eng. R. C. Waterstaat, presented to the International Congress of St. Louis, 1904, which cover the crest of the subjacent sand dam. (This submerged sand dam is to be raised in the shortest possible time by powerful suction dredgers).

PLATE VIII.



Fig. 1.

Proposed Dam in the Zuyder Zee.

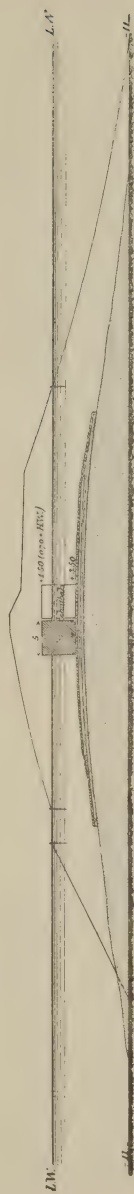


Fig. 2.

Taken from the Work: "De Afsluiting en Drooglegging der Zuiderzee." Edited by the Zuiderzee-Vereeniging.

feet broad and also $16\frac{1}{2}$ feet high. They will be placed at intervals of 146 feet on layers of brushwood mattresses. When this row is put in place, a second row of caissons of the same dimensions placed backward of the first row will close the intervals.

A minority of the Committee did not approve of the proposed method and preferred the older one. It will, however, be possible to make a trial on a smaller scale. The draining of the Zuyder Zee also necessitates a dam between the coast of North Holland and the island of Wieringen, where the currents are rather strong. Here a gap in the dam of a length of 654 yards will have to be closed in the same way. The cost of these caissons is estimated at \$ 30.5 per running foot ¹⁾.

¹⁾ Similar caissons were constructed for the quays of the harbour of Rotterdam, and by a Netherlands firm of contractors for the harbour of Talcahuano (Chile).

CHAPTER III.

RIVERS, CANALS AND HARBOURS.

1. The Three Principal Rivers: RHINE, MEUSE, and SCHELDT. (*Rijn, Maas, Schelde*).
 2. The Principal Branch of the Rhine, called the Waal.
 3. How the Forming of Ice-jams is Prevented.
 4. How the Depth of the Waal was Increased.
 5. How Rotterdam is Reached from the Waal.
 6. The Waterway from Rotterdam to the North Sea.
 7. The Hook of Holland.
 8. The Waterways of Amsterdam and the Port of Ymuiden.
 9. The Merwede Canal. The Poor Condition of the Subsoil.
 10. The New River called the Bergsche Maas.
 11. Canals through the Moors.
 12. How the Moors are Attacked and the Subsoil turned into Arable Land.
-

1. THE THREE PRINCIPAL RIVERS.

The vital importance of the Netherlands network of rivers and canals is strikingly illustrated by the fact that the railways must content themselves with extremely low rates in order to compete with the waterways. The freight rates are a third of those charged in England, and are also much less than those of Belgium and Germany.

Three large rivers find their way to the sea through the Netherlands: the Rhine (*Rijn*), the Meuse (*Maas*) and the Scheldt (*Schelde*). The Rhine is by far the most important. Soon after passing the frontier, this river splits into three branches. Of these the Waal takes two-thirds of the waters

and nearly all the international traffic. For this reason only this branch will be considered in the following pages ¹).

2 THE PRINCIPAL BRANCH OF THE RHINE: THE WAAL.

The maximum discharge of the River Waal is 218,900 cubic feet per second and the minimum is 21,200 cubic ft. per second. The mean fall is about 0.58 ft. to the mile. The rains in Germany cause the river to rise in winter, and the melting of Alpine snows cause summer floods, which often inundate the *uiterwaard(en)* (lit. outlying lands). These are broad stretches of meadows, protected by low crested levels only, which are totally submerged in winter.

The mean velocity of the river varies from $2\frac{1}{4}$ ft. per sec. to $5\frac{1}{2}$ ft. per sec.; the winter floods cause the water to rise $14\frac{1}{2}$ ft. above the lowest summer level. The floods carry much gravel and sand, and deposits are formed by reason of the slowness of the current.

The number of vessels navigating the Waal and their tonnage are steadily increasing. In 1913 26,990 steamboats passed to and from Germany — mostly tugs — and 69,778 sailing vessels and barges, carrying 45 million tons of merchandise. By far the greater part of the goods are loaded at Rotterdam or destined to that port, this being the port of transshipment for sea-going vessels.

The largest quantity of goods is conveyed in barges, the dimensions of which are steadily increasing. At present the maximum dimensions are: length 400 ft., beam $46\frac{1}{4}$ ft., draught $9\frac{1}{3}$ ft., dead-weight capacity, 3,583 tons. Practically all the river craft are built in Netherlands yards, although a large number are owned by Germans.

To avoid the cost of transshipment, German shipowners

¹) More complete information, also with regard to the other branches, will be found in the paper presented to the St. Louis Congress 1904, by Mr. MARINKELLE, Eng. R. C. of the Waterstaat. (Trans. Am. Soc. C. E.). Also in the papers presented to the Philadelphian Intern. Navigation Congress, 1912, by Messrs. GOCKINGA, BAUCKE, VAN KONIJNENBURG and VAN PANHUIJS, Engineers of the Royal Corps of the Waterstaat.

have built sixty sea-going river steamers. These sail from Cologne to England and to German sea-ports. Their dimensions are: length $239\frac{1}{2}$ ft., beam $34\frac{3}{4}$ ft., draught $14\frac{1}{3}$ ft. Load (when on the river) 1,880 tons. Engines 600 I. H. P. When the river is low, up-going vessels partially unload at Rotterdam.

3. HOW THE FORMING OF ICE-JAMS IS PREVENTED.

Before 1850 Netherlands rivers were in a bad condition and little was done to improve them. Numerous shoals, sharp river bends and the system of lateral overflows, *zijdelingsche overlaat(en)*, facilitated the forming of ice-jams.

These overflows were lateral gaps in the levees, allowing the floods to spread over large areas, in order to prevent the water rising to a dangerous level. Of course, such gaps were only made at spots where the floods could do small damage, and where the land could afterwards be drained by gravitation.

This system, however, had great disadvantages. It weakened the current in the river proper, and lessened the water pressure against the ice-jams. This caused ice-jams to settle and retarded their breaking-up. At present most of these overflows have been closed; the dikes are strengthened and their crests raised where necessary.

Ice-jams frequently formed where the river split into two channels, as this weakened the current. For this reason all double channels have been changed into single ones by damming up the less important one.

Sudden changes in the width of the river had the same effect, and this was also the case with sharp bends. The width of the river has therefore been regulated by groynes, made of brushwood and covered with rubble, and the sharp bends have been systematically eased. Experience has fully proved the efficacy of these measures; ice-jams are now things of the past.

4. HOW THE DEPTH OF THE WAAL WAS INCREASED.

In the middle of the 19th century an international agreement fixed the general dimensions of the Rhine and its outlets. The mean water level of the river at its minimum discharge, during a consecutive period of ten days, was taken as the basis for all improvements. It was resolved to improve the river to such an extent that at this level a depth of 9 ft. 10 in. of water would be available from Cologne to the North Sea. The German part of the Rhine did not fulfil these conditions, and in many places a depth of only $4\frac{3}{4}$ ft. to $5\frac{3}{4}$ ft. was found in the channel. The Netherlands part of the Rhine and the Waal were also in an unsatisfactory condition.

In those days (1850) no accurate river maps existed, and the science of river improvement was still in its infancy. In consequence the first attempts to obtain the desired depth failed in some ways. It was then resolved to reduce the width of the Waal to 1,180 ft., but in 1889 the summer bed had to be narrowed to 1,017 ft. On part of the course the curves were modelled in accordance with the rules laid down by the famous French engineer M. FARGUE.

These measures did not give entire satisfaction. It was therefore decided (in 1909) to reduce the width of the summer bed to 863 ft., to ease the bends, etc. The direction of the groynes was also changed; formerly they were set perpendicularly to the axis of the river channel, at present they incline 70° to 80° in an upward direction. Their crest lies 18 inches below the ordinary summer level.

5. HOW ROTTERDAM IS REACHED FROM THE WAAL.

The River Waal nominally ends near the small town of Woudrichem, where formerly its waters mingled with those of the Meuse. A short distance farther down the stream divides, and only the north-western branch is of importance for navigation. It flows past the towns of Gorinchem and Dordrecht. From the latter city a narrow but deep stream, called the Noord, leads to the branch of the Rhine which

flows past Rotterdam and there takes the name of *Nieuwe Maas* (New Meuse).

(This New Meuse does not contain a drop of water from the Meuse. Its name is however historically justified, as in ancient times the Meuse flowed in that channel).

From Woudrichem to Rotterdam the required depth of 9 ft. 10 in. is easily maintained, as here the scouring influence of the tides is felt.

6. THE WATERWAY FROM ROTTERDAM TO THE NORTH SEA.

A most difficult problem awaited the Netherlands engineer westwards from Rotterdam. Eastwards from that town only rivercraft had to be provided for, but modern sea-going vessels required greater depth than the river could offer. One was at a loss how to meet the difficulty when, by a stroke of genius, a young and still unknown engineer of the Royal Corps of the Waterstaat, P. CALAND, found the solution. During his residence at the town of Brielle he was impressed by the amount of scouring power tidal currents acquire when guided in a proper manner. This is even the case when the tide range is small, as in the New Meuse, where the range is only 5 ft

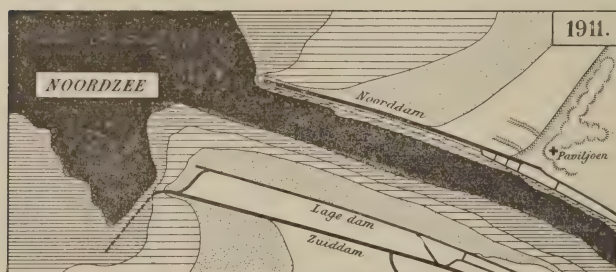
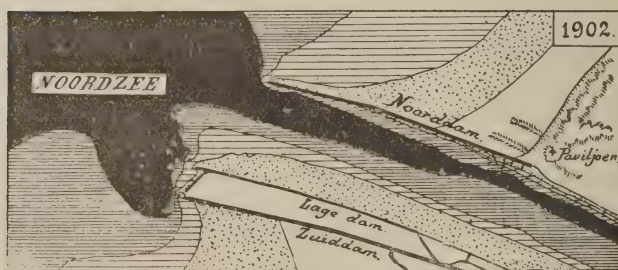
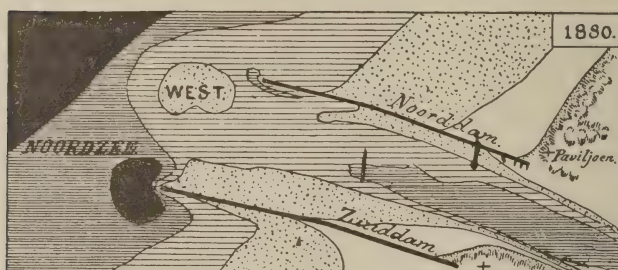
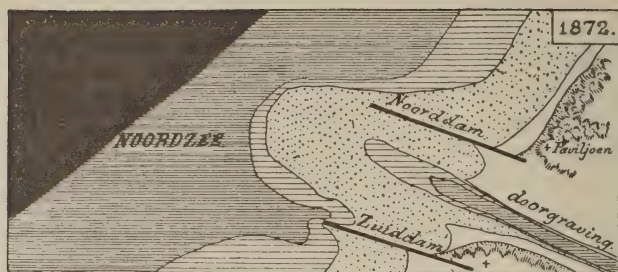
In order to employ to the full the scouring capacity of the tides, M. CALAND closed every byway of the stream, gave to its lower part a fan-like shape, and substituted for the crooked outlet near Brielle, a short cut through the immense shoal called the Hook of Holland.

M. CALAND exposed his theory on the scouring power of tidal rivers in a paper presented to the Netherlands Institute of Civil Engineers. His idea still forms the basis of all tidal-river improvements.

7. THE HOOK OF HOLLAND CHANNEL.

The channel through the shoal was extended into the North Sea by two low jetties formed of brushwood, reaching down to a depth of 23 ft. below low water. This depth was, in

PLATE IX.



 5 tot 8 M. onder laagwater.  Meer dan 8 M. onder laagwater.

15—20 feet under low water level. Over 24 under low water level.

1858, considered sufficient for the largest sea-going craft ¹).

The length of the northern jetty is at present 6,560 ft. The southern jetty was planned much shorter in order to force the flood current — running parallel to the coast in a northerly direction — to enter the river mouth. The width of the outlet was fixed at 2,952 ft. at the end of the jetties.

At first, however, the works at the Hook of Holland failed to a certain extent to give satisfaction. The reason was a curious one. Fifty years ago Netherlanders were rather parsimonious, and M. CALAND had to reckon with this propensity. So he estimated that the works would cost only two million of dollars and trusted to the scouring tides for the widening of his short cut through the shoal. He dug a channel of 164 ft. wide only, though the definite width was fixed at 2,300 feet.

Of course the tidal current in this narrow channel was very strong, for this channel formed the only outlet of the broad New Meuse. The current deepened the channel considerably, but refused to widen it. When the current reached the broad tranquil surface between the jetties, it slackened, and deposited the loose sand which it carried near the sea end of the piers. (Plate IX).

This deposit formed a bar of considerable dimensions, which was difficult to attack by dredging, the sea being very rough. In order to force the currents to scour away this bar, the southern jetty was gradually prolonged to a total length of 7,544 ft. (Cross sections of the jetties are shown on plate X).

This work proved a partial success only, and the same is to be said of the narrowing of the channel between the jetties by sinking a low dam at a distance of 700 ft. from, and parallel to, the southern pier.

Some years ago, M. JOLLES, Eng. R. C. of the Waterstaat, then in charge of the works, called attention to the fact that by gradually prolonging the southern jetty, the original

¹) A detailed account of this work is found in the report of Brigadier-General of the U. S. A., J. G. BARNARD, already mentioned. This eminent engineer fully approved of M. CALAND's plans.

idea of M. CALAND had been abandoned, and that this explained the failure of the new improvements. The flood tide, instead of being intercepted by the northern jetty and forced to enter the river, was now deflected into the sea by the long southern jetty, which at present acts as a gigantic groyne, causing whirlpools in the river mouth.

In order to neutralise the effect of this extension of the southern jetty, M. JOLLES proposed the construction of a low dam 2,300 ft. long, running parallel with the coast, at the sea-end of that pier. This would prevent the forming of secondary currents and normalize the influx of the tide. Actually a length of 950 ft. is raised till above the mark of high water, while the remainder lies about ten feet below low water mark. Various phases of the bar in the mouth of the river are shown on plate IX.

At the present day a depth is found between the jetties of 30 ft. 8 in., at ordinary low water, in a channel 4,000 ft. wide, and the largest vessels can enter the New Waterway at half-tide and sail up to Rotterdam ¹⁾.

8. THE WATERWAYS OF AMSTERDAM, AND THE PORT OF YMUIDEN.

To meet modern requirements, important changes were necessary in the communication between Amsterdam and the Rhine and the North Sea. A new canal, the Merwede Canal, connects Amsterdam with the Waal and also with the minor branch of the Rhine, called the Lek. A short cut through the sand-hills connects Amsterdam with the North Sea near the village of Ymuiden.

The port of Amsterdam is described in N^o. I of this series of booklets, while a detailed account of the harbour of Ymuiden was presented by M. WORTMAN, Eng. R. C. of

¹⁾ M. JOLLES has written a paper on the waterway from the German frontier to the North Sea for the Congress to be held at San Francisco under the auspices of the Am. Soc. of C. E. The port of Rotterdam is described in N^o. I of the present series of booklets.

PLATE X.

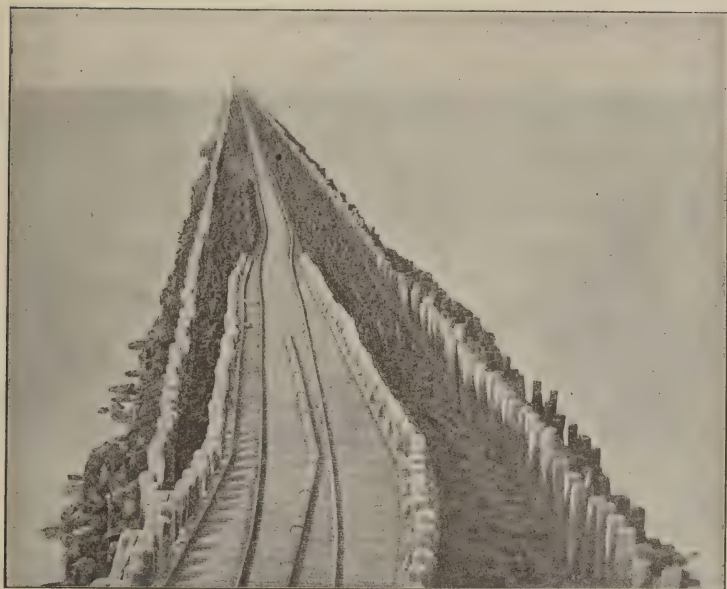


Fig. 1.
Southern Dam.

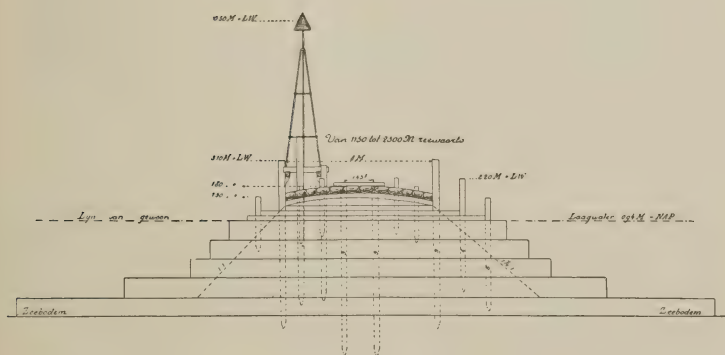


Fig. 2.
Southern Jetty of the Hook of Holland.

the Waterstaat, to the San Louis Congress 1904. (Trans. Am. Soc. C. E.).

The lock built at Ymuiden in 1891/95 is now considered insufficient, and a second lock of still larger dimensions is to be constructed. The length will be 1,312 ft., width $147\frac{2}{3}$ ft., and depth on sill 49 ft. below N. A. P.

For the same reason the width of the canal has been increased since 1904 to 164 ft. at the bottom and its depth to $32\frac{1}{6}$ ft. below the mean canal level (1 ft. 8 in. below N.A.P.), while both railway swing-bridges have been replaced by new ones with spans of 180 ft. The only passenger bridge on the canal has been demolished and a steam ferry now conveys the traffic across.

9. THE MERWEDE CANAL.

The Merwede Canal, from Amsterdam to the Rhine, and which passes by the city of Utrecht, was opened in 1892.

Its length is $44\frac{1}{3}$ statute miles; width at the bottom, 66 ft., depth 10 ft., cost, \$ 8,300,000. It is divided into four sections, which are separated by locks. The regulations allow the passage of vessels with a maximum length of 328 ft., a beam of $37\frac{1}{2}$ ft., and drawing $7\frac{1}{4}$ ft. When their length is less than 279 ft. and the beam less than $33\frac{1}{2}$ ft., a draught of $9\frac{1}{4}$ ft. is allowed ¹⁾.

In many sections the subsoil was extremely poor. Therefore when constructing the lock near Amsterdam, the subsoil was first removed by dredging, to a considerable depth, and replaced by sand from the sea-dunes. In this compact mass the foundation pit was excavated without any trouble. The piles on which the construction rests, were then driven into the ground.

This poor condition of the subsoil also caused trouble when constructing the earthen accesses to the railway bridges on the canal. These bridges leave the vessels a free height of $21\frac{1}{2}$ ft., and the earthen inclines which lead to these bridges,

¹⁾ Details of the canal will be found in the paper presented to the Congress of St Louis by Messrs. VAN HOOGENHUYZE and DE LINT.

weighing heavily on the subsoil, they partially settled as shown on plate XI, fig. 1. The layers of peat in the subsoil were compressed by the weight of the dam till pressure and counter-pressure balanced each other.

The same thing occurred in other parts of the country. A very bad case is shown on the same plate, fig. 2. This cross section is taken on the railway line from Hook of Holland to

PLATE XI.

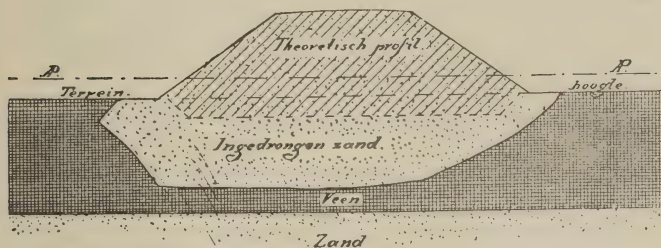
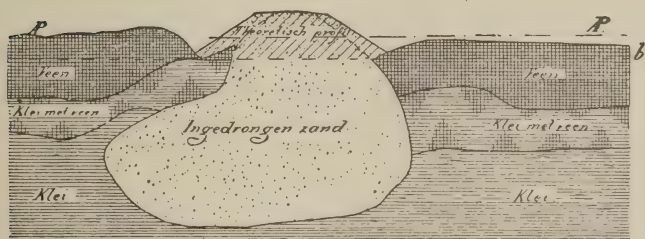


Fig. 1.



a. b. Oorspronkelijke terrein hoogte

Schaal voor beide profielen
1 à 400



Fig. 2.

Schiedam. In some spots the road bed had to be laid on a wooden platform, supported by piles. By the same process a canal was recently changed into a paved road at Rotterdam¹⁾.

The bad condition of the subsoil of the Merwede Canal

¹⁾ In former times a road bed often rested on layers of brushwood. Part of the railway between Amsterdam and Haarlem was constructed in this manner.

led the late M. KLUIT, Eng. R. C. of the Waterstaat, to invent suspended siphons (see plate XII, fig. 1).

The iron plate siphon forms a kind of tubular bridge, resting at its ends on stone abutments. When the siphon needs repairing, the sluice-gates in the abutments are closed and the tube is floated to a repairing yard. In this manner repairs do not interfere with traffic on the canal.

10. THE NEW RIVER CALLED BERGSCHÉ MAAS.

Some years ago the Meuse still discharged into the Waal near Woudrichem.

In order to improve the hydraulic condition of the province of North Brabant it was resolved, in 1883, to form a separate outlet for the Meuse (the discharge of this river varies from 12,400 cubic ft. per sec. to 953,100 cubic feet per sec.). The new river mouth is called the Bergsche Maas, because it flows near the city of Geertruidenberg. It has a total length of $13\frac{3}{4}$ statute miles. The width of the summer bed gradually increases from 135 yards to 250 yards; the levees are erected at distances of 545 yards. The total cost was £ 10,000,000. Of course many minor works (canals, pumping plants, etc.) are comprised in this sum. The new outlet was opened in 1904.

11. CANALS IN THE MOORS. [*Kanaal(en) in het hooge veen*].

No engineer visiting the Netherlands should fail to visit the north-eastern part of the country. While the western part, the *polderland*, was shaped by the inhabitants many centuries ago, modifications in the east are of recent date. In the north-eastern provinces of Overijssel, Drenthe and Groningen, and also in the south-east (North-Brabant and Limburg) we find a kind of fen totally different from the Holland fen. In Holland the fen, called low-fen (*laag veen*) is formed by successive layers of decaying water plants. This kind of fen is therefore found below the water level.

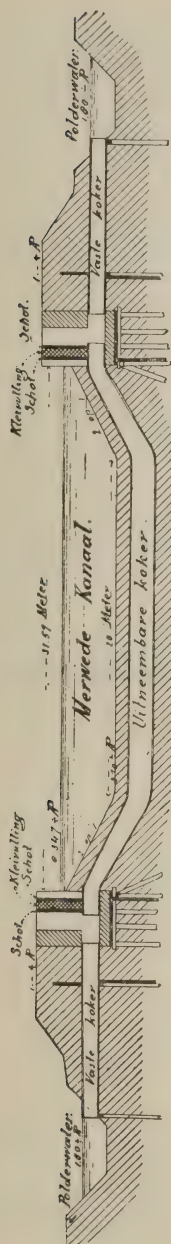


Fig 1.
Section of the Merwede Canal.

On the contrary the high fen (*hoog-veen*) in the north-eastern parts consists of successive layers of moss, heather, dead bushes and trees. These materials decayed in the air and formed a loose peat, which produces an inferior fuel, burning easily, but containing less calories than the solid Holland peat.

While the subsoil of the low fens generally consists of sea-clay, the high fen rests on a sandy soil, lying many feet above the sea-level.

12. HOW THE MOORS ARE RECLAIMED, AND THE SUBSOIL TURNED INTO ARABLE LAND.

First the high fen or moorland is drained by digging trenches in order to draw off the water. This canal system is completed by transverse ditches, and a main drain. (Plate XII, fig. 2). The moor or fen gradually shrinks to about two-thirds of its volume, and after a couple of years is firm enough to be cut, by hand or machinery. The turfs are then set in stacks to dry.

The uppermost layer, consisting of moss-litter peat, oxidized by the air and still fertile, is carefully laid aside and afterwards deposited on the sandy subsoil. It forms excellent arable land, as the permeable subsoil draws off all the superfluous water. The first year this layer is ploughed just deep enough

to mix a little bit of the sandy subsoil with the peat. In after years more and more sand is ploughed up and mixed with the peat. The water level in the canals is kept on a plane within easy reach of the roots of the crops, so that

PLATE XII.

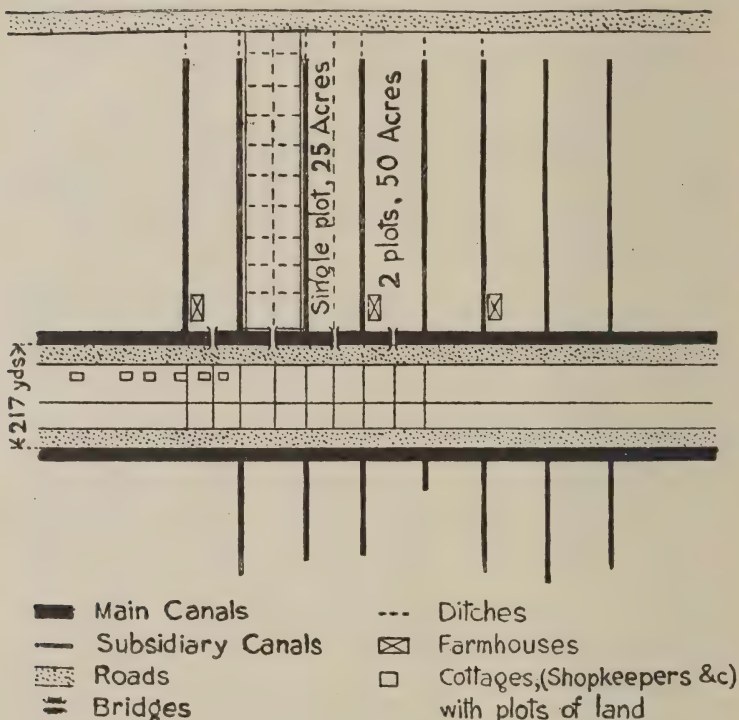


Fig. 2.

The Double Canal, Fen Colony System.

From: ROBERTSON SMITH. A Free Farmer in a Free State.

the raising of vegetables proves a most profitable undertaking and a large export trade has sprung up.

About 250,000 acres of moorland have already been transformed into arable land. The digging of trenches and

canals, the cutting of the peat, etc., costs about \$ 625 per acre. The peat sells at \$ 960 to \$ 1,250 per acre.

A visit to the fen colonies, *veen-kolonie(en)* in the south-eastern part of the province of Groningen is specially recommended. The social organisation of these farmers also deserves attention. Large strawboard, starch and beetsugar mills have been started by them on a coöperative basis. The city of Groningen also owns vast tracts of cultivated moorland ¹⁾.

¹⁾ A vivid description of fen colonies is to be found in Mr. ROBERTSON SCOTT's book, already mentioned in chapter I Fig. 2, Plate XII reproduced one of its numerous illustrations.

Mr. W. A. KERR in his exhaustive study on *Peat and its Products* (Glasgow, BEGG, KENNEDY & ELDER, 1905) states: The systematic working of a peat-bog is best understood in the Netherlands, and lately some hundreds of Hollanders have been imported to work the moors at Thorne and Hatfield Chase near Doncaster. Also on that part of Chat Moss acquired from the Astley Estates Company by the Corporation of Manchester. The Dutch peat-cutter has a deservedly high reputation for skill.

CHAPTER IV.

FRESH WATER SUPPLY AND SEWAGE DISPOSAL.

1. Introductory.
 2. The Underground Fresh Water Reservoir in the Sandhills (*duinen*).
 3. The Troubles of Amsterdam With Regard to the Water Supply.
 4. The Water Supply of Rotterdam and of other Netherlands Towns.
 5. The Sewage Disposal of Amsterdam.
-

1. INTRODUCTORY.

In the western part of the Netherlands, where the land lies below the level of the sea, the fresh water supply and the disposal of sewage are most serious problems, especially as in latter years the population of the larger towns has increased considerably and more attention is paid to hygiene. (Amsterdam had in 1869 a population of 264,694, and in 1912 of 587,876; Rotterdam had in 1869 a population of 116,232, and in 1912 of 446,897).

Not long ago, only the rain falling on the roofs and collected in cisterns provided Amsterdam with drinking water. This is also the case in the country, for the water in the canals and ditches is brackish and is often not even fit for cattle.

The sewage system of Netherlands towns was very primitive. Cess-pools abounded, and as there are no running waters, the sewage which was delivered into the stagnant canals without being treated by chemical or other processes, formed an indescribable mass, offensive to sight and smell.

2. THE UNDERGROUND FRESH WATER RESERVOIR IN THE DUNES OR SAND-HILLS. [*Duin(en)*].

Fortunately the sand-hills bordering the North Sea coast form an underground water-reservoir of considerable dimensions. This, however, was not utilized till JACOB VAN LENNEP, a popular novelist and poet, directed the attention of his fellow-townsmen to this mine of water, and induced them to form a company for the purpose of supplying Amsterdam with pure water.

The present author, who then lived at Haarlem, remembers considering it a treat to drink this "*duin*" or dune water, when visiting the capital. For Haarlem, though situated at the foot of the hills, did not use *duinwater*, but was supplied with ordinary well water of indifferent taste. Imitating the camels, he would take his fill before returning home.

The death-rate of Amsterdam, which was 28.46 per thousand inhabitants, fell considerably after this fresh-water supply had been laid in 1854. (It was in 1913 reduced to 11.11 per thousand, comparing favorably with New York's 13.76 and London's 14.39).

2. DIFFICULTIES WITH THE WATER SUPPLY AT AMSTERDAM.

Some years ago doubts were raised about the lasting capacity of this underground reservoir. Hydrological experts, however, did not agree, and so an expensive and thorough investigation was ordered by the city of Amsterdam.

The results of this investigation, which are of general interest, will be briefly exposed here ¹⁾.

The sand-hills which supply Amsterdam with fresh water are found westwards of Haarlem, and cover 6,400

¹⁾ Particulars are found in the paper presented to the St. Louis Congress 1904 by M. PENNINK, Director of the Amsterdam Municipal Waterworks.

acres. Their average height is twenty-two feet above the sea-level. They stretch from the North Sea coast to the *polderland*, a distance of $2\frac{1}{2}$ statute miles.

Only a fraction of the rainfall on this area is available. The rainfall partly evaporates and partly percolates into the low-lying Haarlem Lake polder. On an average, an acre of sand-hills yields 341,000 gallons of drinking water per year. As it will be possible to extend the total area to 6,810 acres, the annual supply can be increased to 2,320 million gallons per year.

This quantity is not sufficient. The population of Amsterdam consumed 3,430 million gallons in 1913, or about a thousand millions more than the annual rainfall supplies.

This excess was drawn from the subjacent layers of sand by pumping. It formed part of the reserve accumulated there in the course of centuries. But this reservoir is not inexhaustible. The former director of the works, M. VAN HASSELT, bored a great many wells on the sand-hills belonging to Amsterdam, and found that the total quantity of fresh water stored in these hills amounted to 66,000 millions of gallons only. If we take into consideration the yearly increase in population and the spreading habits of cleanliness, this reserve (even if totally available) would scarcely suffice for some sixty years. But long before the end of this period even the annual supply of rainfall will be worthless.

To understand this, it must be borne in mind that the sand-hills, through which the rain percolates, rest on layers of sand which are connected with the salt water of the North Sea. This seawater forms a subterraneous current, flowing from west to east, from the sea to the low-lying Haarlem Lake polder.

The fresh water stored in the sand-hills floats on this salt water, which is of greater specific gravity. The salt water is forced downwards by this great mass of fresh water to a depth of 240 feet below the sea-level, as is shown on plate XIII, fig. 1.

The grade level of the salt water does not form a constant plane. When, by pumping, the mass of fresh water diminishes, its weight also decreases and the salt water

PLATE XIII.

HYDROLOGICAL SECTION
FROM THE NORTH SEA OVER THE DUNES INTO THE
HAARLEMMEER MEER POLDER
(OBSERVATIONS ON OCTOBER 20TH AND 21ST, 1903.)

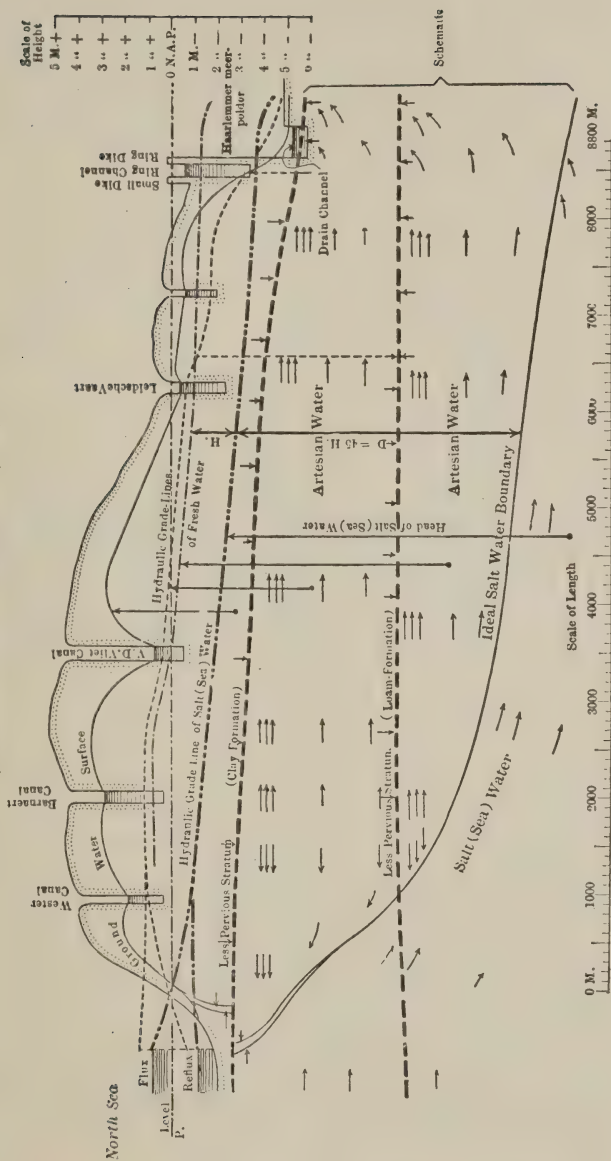


Fig. 1.

Cross Section of Sand Hills near Haarlem, forming the Subterranean Water Reservoir of Amsterdam.

ascends. When a certain part of the fresh water has been consumed, the sea water will rise to the level of the drains, and mix with the rain water which percolates through the sandhills. This mixture will then be brackish and unpotable.

This danger is not imaginary. The towns of Delft and Leyden are supplied with water from the sand-hills in the same manner, and injudicious pumping has already led to trouble.

PLATE XIII.

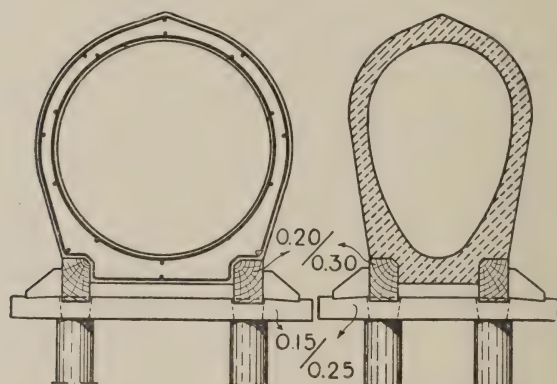


Fig. 2.

Cross Section of Amsterdam Sewers.

The only way to avoid the difficulty is by artificially increasing the rainfall on the sand-hills. The present director of the works proposes to irrigate the hills by water from a branch of the Rhine (the River Lek). A pumping plant will be installed near the town of Schoonhoven, on that river, and the river-water then pumped to the sandhills near Haarlem. This will prove cheaper than the installation of a purifying plant at Schoonhoven and carrying the purified water directly to Amsterdam. No special artificial purifying will be required if the river water percolates through the sand-hills of Haarlem.

4. THE WATER SUPPLY OF ROTTERDAM AND OTHER TOWNS.

Rotterdam is the only large city in the Netherlands which is supplied with purified river-water. At the present day many combines of country towns and villages are planned for supplying fresh water from the sand-hills or from the subterraneous layers of sand, which form the substratum of the Netherlands almost everywhere. The Government appointed a Board in 1913 which advises communities desirous of ameliorating their water supply. The Government also grants subsidies for making surveys, etc.

5. THE SEWAGE DISPOSAL OF AMSTERDAM.

Of all Netherlands towns, Amsterdam presents the most difficult problem with regard to its sewage disposal. It has by far the largest population, and disposal by gravitation, which was always difficult, is now almost impossible, since in 1870 a dam was built across the Y. (This is the landlocked inlet of the Zuyder Zee into which the water flows from the *gracht(en)* (canals) of Amsterdam. At the present time the Y forms part of the North Sea Canal, which connects Amsterdam directly with the North Sea by a short cut through the sand-hills fringing the coast. In this canal a constant water level of 1 ft. 8 in. below N. A. P. is maintained.

The sewage of the inner or ancient part of Amsterdam flows freely into the *grachten*. Many years ago it was proposed to fill up a number of the principal ones, and to establish a network of sewers, but the expenses proved too great. Moreover the death-rate of Amsterdam is low (as has already been observed) which proves that polluted canals are innocuous provided care is taken to supply pure water for drinking and household purposes. However, a certain degree of improvement was imperative, to prevent the smell becoming intolerable, so the canals are now flushed by pumping. The sluices and locks which connect the canals with the Y and with the River Amstel being closed, the water level in the canals is artificially lowered by pumps placed near the

Zuyder Zee. In the evening and during the night, fresh water is let in from the Zuyder Zee at high tide, while the polluted waters are evacuated on the Y. Twice a week the same is done in the ancient part of the town with water from the Amstel.

Since 1870 the population has doubled, and half the inhabitants of Amsterdam now live in the suburbs which have sprung up on the outer side of the semi-circular canal, called Singel, the ancient defence of the city. In these suburbs but few canals are found, so the sewage problem has assumed another form there.

The sanitary arrangement of the houses prevents the separation of the water for household purposes from the sewage. Many years ago the LIERNUR system was tried. This system proved satisfactory from a technical point of view, but too expensive. It was also a constant source of irritation to the residents, as flushing of water-closets was prohibited, this increasing the cost of the drying up of the sewage, which formed part of the system.

M. VAN HASSELT, the former Director of Public Works, therefore suggested another solution, which was accepted by the Town Council. In 1907 the sum of \$ 1,200,000 was provisionally voted for its execution.

The project is based on the following data: Population per acre. 243. Consumption of water (sewage) per head and per 24 hours, 33 gallons. Maximum rainfall 8 inches. Of this rainfall $\frac{2}{5}$ ths to be drained while the shower lasts

To save expenses, the storm flow is discharged into the canals, and the main sewer only collects the dry weather flow, which is about $\frac{1}{22}$ nd. part of the storm flow. For this reason a diameter of 4 ft. 11 in. suffices for the main sewer. The eastern or terminal part of this sewer will almost always be full, so there was no objection to giving it a circular shape.

This main sewer, the terminal part of which is calculated for a flow of 375 gallons per second, is laid along the outer embankment of the aforesaid Singel. From this main sewer secondary sewers branch off. These collect all the sewage and storm water. Automatic sluices have been constructed at the connecting points with the main drain. These allow the storm water to discharge into the canal.

From a sanitary point of view this system is not objectionable, as experience has proved in the older part of the city. One must also bear in mind that in the Amsterdam canals the water level is almost constant, and the sludge remains permanently submerged.

Most of the secondary sewers lie below the water level in the canals. They descend even to $14\frac{1}{4}$ ft. below N.A.P. At many places electrically-operated pumps are therefore inserted in the network of sewers, which deliver the sewage into the main drain. Finally the sewage is pumped from the main drain into the Zuyder Zee.

The sewers are made of concrete and rest on a pile foundation (see plate XIII, fig. 2).

The present Director of Amsterdam Public Works, M. A. W. Bos, is preparing a paper on this system for the Congress of San Francisco.

In the other towns the sewage generally flows freely into the canals, without purification. The almost constant water level in these canals permits the retention of this primitive method.

CHAPTER V.

DEEP FOUNDATIONS.

1. Pile-driving.
 2. Ancient Pile Foundations: Foundation of the Steeple of the Western Church at Amsterdam. The Settling of Foundations: Fissures: the old Western Railway Viaduct of Amsterdam.
 3. Modern Foundations: the new Western Railway Viaduct at Amsterdam, the Quay of Delfzyl Harbour, the Jetties of Scheveningen Harbour.
-

1. PILE-DRIVING.

Foundations resting on piles are naturally most common in the western part of the Netherlands, where the soil consists of peat or soft clay. Whenever possible, the piles are driven down to the level of the solid sand, which is generally found under the layers of clay or peat. This is not possible in cases where the sand lies too deep below the surface. In that case the engineer relies on the sucking power of the intermediate layers. These keep the pile suspended, provided care is taken not to put too heavy a load on the top of the pile. In order to prevent decay, the top of the pile always lies below the average water level.

Fir is generally used for piles, their length varying from 23 ft. to 50 ft., or more.

2. ANCIENT PILE FOUNDATIONS.

Formerly the alder tree flourished on the Netherlands low lands and was much used in pile-driving, though this wood decays under water. The common practice was to dig a hole, to place in this hole a bottomless barrel, and then to drive a sheaf of slender alder stakes through this barrel into

the subsoil. When the barrel was completely filled in this manner, it acted as a wooden ring, firmly holding the stakes together. Rows of these barrels formed the foundation, and on top beams were laid which supported the masonry. Later on, when the trade with Norway flourished, fir was imported and used for piles. The more important buildings were founded on double rows of piles (distance between the rows 3 ft.). When the building was of minor importance, the double rows alternated with single ones. The large churches and their steeples had to be treated in another way. For example, the steeple of the Western Church at Amsterdam, (*Westerkerk*) which attracts the attention by its graceful originality, was founded in 1619 by first excavating the soil down to 11 ft. 10 in. below A. P. and forming a hollow quadrangle of $54\frac{1}{4} \times 54\frac{1}{4}$ ft. Seven rows of piles were driven in in one direction, and seven other rows in a direction crossing the first at right angles. In this way the quadrangle was divided into 36 small ones. Beams and crossbeams ($15\frac{3}{4}$ in. $\times$ $15\frac{3}{4}$ in.) were then laid on top of these rows, and solidly fastened to the tops of the piles. Round the quadrangle a sheet-piling was driven in, formed by boards, $16\frac{1}{2}$ long and $5\frac{1}{8}$ in. thick.

The 36 small quadrangles were then entirely filled with pile work. The length of these piles varied between 26 ft. and 53 ft.; the number driven in in each quadrangle varied from 64 to 81 -- according to their greater or smaller circumference. The total number of piles driven in was 3,624. The driving of this mass of piles, which was executed by two gangs of pile drivers, each numbering 70 men, is believed to have taken five months. Forty years ago it was estimated that such a foundation would at the present day cost \$ 30,000, including the masonry to the level of the roadway.

In the latter half of the 19th century the water level in the canals of Amsterdam was lowered by some inches. This has in many cases caused serious trouble, as the tops of the piles and the wooden superstructure on which the masonry rests, being no longer under water, soon began to decay. Many houses on the *grachten* had to be propped up in a most expensive manner.

Nowadays, instead of the wooden platform, which rests on the piles and forms the base of the masonry, concrete is frequently used. The tops of the piles are imbedded in this mass. Concrete piles are also used now.

Even when the utmost care is taken, the masonry often shows fissures, caused by the settling of the foundations. This is specially the case with great masses of masonry. The late Inspector-General of the Waterstaat, M. CONRAD, when visiting a newly-built lock, was in the habit of greeting the engineer in charge with the query, "Where is the fissure?", being convinced that it was impossible to build a lock without such an accident. At the present time, at spots where fissures may be expected to form, small interstices are left, which — when the lock is completed — are filled with asphalt.

A most striking proof of the poor condition of the subsoil can still be seen at the viaduct on the east side of the Central Station of Amsterdam, which was built in 1874.

The former western viaduct was in still worse condition. The eastern abutment of this viaduct gradually inclined backwards, at the same time sinking about 5 ft. It was necessary to underprop the iron girders of the railway.

The cross-section of this viaduct is shown on plate XIV, fig. 1. On the top of piles 28 ft. long, rested a layer of concrete, only $7\frac{3}{4}$ ft. thick. Some years ago the viaduct was demolished and a new one was built on a foundation of pneumatic caissons. This gave an opportunity to examine the old foundations, and the piles proved to have been twisted and broken by lateral pressure of the subsoil.

In order to understand this, it is necessary to know how the Central Station was built. The foundation of the station and the viaduct on either side were laid in the Y. The bottom of this inlet of the Zuyder Zee consists of mud, resting on a subsoil of clay. This mud was removed by dredging to a depth of 20 ft. below A.P. and in its place sand was dumped. In this manner a dam of sand was formed with its crest at 18 ft. above A. P. This large mass of sand caused disturbances in the subsoil on the spot where the viaduct had been built. The solid layer of clay, surrounding the

PLATE XIV.

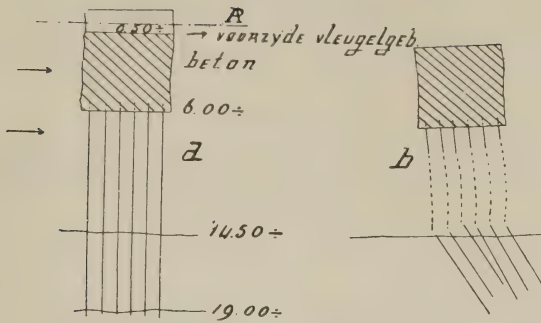


Fig. 1.

Cross Section of Lower Pile Foundation of Railway Viaduct at Amsterdam.

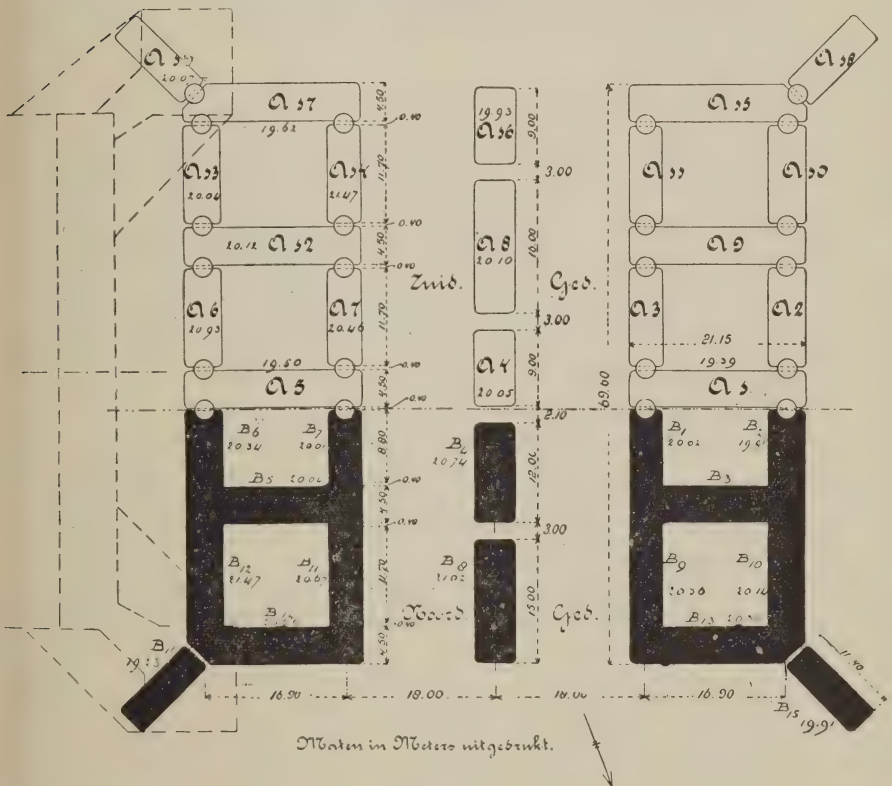


Fig. 2.

Plan of Foundation of Amsterdam Railway Viaduct.

upper half of the piles, did not give way, but the less resistant layers of sand and clay, below this crust, moved in a lateral direction, and so the piles bent and snapped.

3. MODERN FOUNDATIONS.

a. Western viaduct at Amsterdam (Central Station).

The new western viaduct was built on a foundation of 35 caissons, reaching to an average depth of 63 ft. below N.A.P. These caissons are alternated as shown on plate XIV, fig. 2, forming solid blocks 230 ft. long and 69 ft. broad. The entire foundation cost the sum of \$ 856,000. It was described in 1907 by Mr. C. LEEMANS in the weekly periodical "de Ingenieur" (published by the Royal Netherlands Inst. of Engineers. A copy is to be found in the library of the Am. Soc. of C. E.).

b. Harbour of Delfzyl (Province of Groningen).

The new quay in the harbour of Delfzyl was built by sinking hollow cylinders of concrete. Twenty-three of these, each 31 ft. 2 in. long, and 23 ft. wide, were sunk in a row, 41 ft. below N. A. P. First the odd numbers were sunk, then the even numbers. Total cost \$ 900 per yard of quay. The work is described in the paper presented to the St. Louis Congress, 1904, by M. DRUIJVESTELJN, Eng. R. C. of the Waterstaat.

c. Harbour of Scheveningen (near The Hague).

The sea end of the jetties of this harbour is formed by concrete caissons, cast on the beach and floated to their destination.

A description of this work was presented to the St. Louis Congress, 1904, by M. WORTMAN, Eng. R. C. of the Waterstaat.



NETHERLANDS ENGINEERS AND
CONTRACTORS

BY

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CHAPTER I.

TECHNICAL EDUCATION IN GENERAL.

1. Introductory.
 2. The Secondary Education Act of 1863.
 3. The Technical University.
 4. Secondary Technical Education.
 5. Elementary Technical Education.
-

1. INTRODUCTORY.

In 1805 the Netherlands Government decided to form a special corps of State Engineers for public buildings, roads, bridges and canals. These had been looked after until then by the military authorities. This new corps was called the Corps of the Waterstaat (literally: the hydraustatic condition of the country). Its candidates were educated at the military school; the course of study, however, differed from the military course.

In 1842 the Government founded at Delft (near The Hague) a College for Industry and Commerce. To this institution the candidates for posts in the Waterstaat were transferred.

2. THE SECONDARY EDUCATION ACT OF 1863.

In 1863 an Act was passed establishing High Schools (*Middelbaar Onderwijs*). This gave a fresh impulse to Technical Education. The College at Delft was changed into a Polytechnic School with wider scope. For the first time in

The Netherlands special instruction was given in (1) Civil Engineering, (2) Mechanical Engineering, (3) Industrial Engineering, (4) Naval Engineering, (5) Mining, and (6) Architecture.

All naval courses took four years, except that in industrial engineering, which was mainly chemical and took only three years' study. No entrance examination was required, and attendance was not compulsory. The university degree of Civil Engineer could, however, only be conferred upon students possessing the High School matriculation certificate.

Some were Government schools, but most of them were municipal schools. In The Netherlands, boys (and girls) leave the elementary schools at the age of 12 or 13 years. Formerly children of well-to-do people went from this to the "French school", where general knowledge was acquired before entering the Grammar School (*Gymnasium*, or *Latin school*) which prepared them for the University. The Act of 1863 was specially intended, by establishing High Schools, to offer the opportunities of a technical career to the middle classes. Most of these High Schools had (and still have) a five years' course, so that pupils leave these schools at the age of 18 or 19. A number of these enter practical life, but many go to the Polytechnic School at Delft.

In order to obtain the degree of Civil Engineer the student has to pass an examination occupying many weeks before a Royal Commission, composed partly of professors and lecturers at the Polytechnic School, and partly of distinguished engineers.

The Corps of the Waterstaat is entered after a competitive examination, by candidates already possessing the diploma of Civil Engineer.

3. TECHNICAL UNIVERSITY.

In 1905 the Polytechnic School was raised to the dignity of a Technical University. To the board of professors, called *Senaat* (Senate) was granted the right of conferring doctorates. It also obtained greater internal powers. This led to changing the four years' course into a five years' one.

4. SECONDARY TECHNICAL EDUCATION.

For a long while secondary technical education was neglected. Some years ago the growing political influence of the middle classes caused a marked change. Secondary Technical schools were founded or planned in many towns, and large State and Provincial grants voted. These grants generally cover about two-thirds of the expenses, private donations being few.

5. ELEMENTARY TECHNICAL EDUCATION.

Numerous municipal Arts and Craft Schools (*Ambachts-scholen*) have been recently founded, with the assistance of large annual State and Provincial grants. Most of these schools are day-schools for boys of from 13 to 17 years of age.

They chiefly teach their trade to carpenters, cabinet-makers, smiths and painters. In some schools courses of other crafts are also organized.

CHAPTER II.

THE TECHNICAL UNIVERSITY AT DELFT.

1. Number of Professors; the Budget.
 2. Students: Age, Cost of Living.
 3. Course in Civil Engineering.
 4. Course in Mechanical Engineering.
 5. Course in Electro-Technical Engineering.
 6. Course in Naval Engineering.
 7. Course in Chemistry.
 8. Course in Architecture.
 9. Course in Mining Engineering.
 10. The Buildings.
-

1. (TECHNISCHE HOOGESCHOOL) NUMBER OF PROFESSORS; THE BUDGET.

In 1913 the professors numbered 53, lecturers 18, and assistants 74. The Government appoints a Rector Magnificus for three years. He is president of the Board of Professors (Senaat), and his functions are very important.

The Government also appoints a supervising Board of five *Curators*. The Board of Curators takes care of the material interests of the University. The Board of Professors looks after the education.

The college year commences in September, and closes in mid-June. At Christmas and Easter the students enjoy a fortnight's holiday.

Many of the college buildings are imposing new structures, fully equipped with modern requirements.

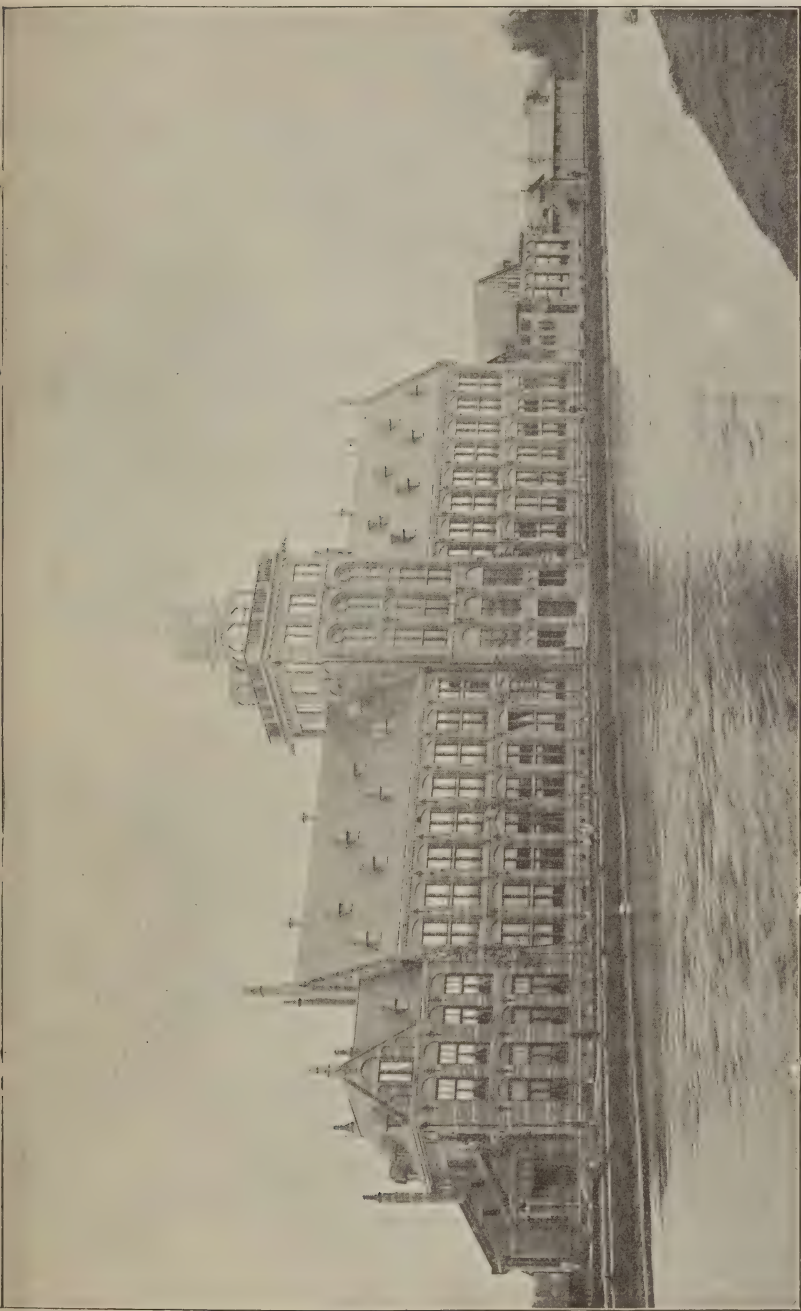


Plate. I. School of Geodesy at Delft.

The University having grown gradually, and not according to a pre-arranged plan, the buildings are somewhat scattered.

Dormitories are unknown at Netherlands Universities, as every student takes care of himself. Many Delft students live at The Hague, the distance being only half an hour's journey.

Annual Budget. (1913).

Salaries.....	\$ 201,000.—
General Expenses	„ 209,000.—
Scholarships.	„ 3,000.—
	\$ 413,000.—

Number of students: 1,432. Of this number 82 were female students.



Comprises:

-  Workrooms of Head Master and staff.
-  Storage room.
-  Lecture hall.
-  Workrooms for teaching purposes.
-  Houses for Head Master, Lecturer and amanuensis.
-  Collections.
-  Stairways, passages, hall, sanitary installations, etc.

Plate 1a. School of Geodesy. Ground floor.

Scale 1 : 1,666²/₃.

2. THE STUDENTS, THEIR AGE, COST OF LIVING, NUMBER AND PROSPECTS.

The student generally enters the University at the age of 18 to 19 years and leaves at the age of 25 or 26. It is, however, not uncommon to find students of 27 still attending the lectures.

An Undergraduate can manage to live on \$ 400 a year

(board and general expenses \$ 240, books and dress \$ 80, college fees \$ 80).

On an average double this amount is spent, except by



Plate II. School of Physical and Electro-Technical Science.

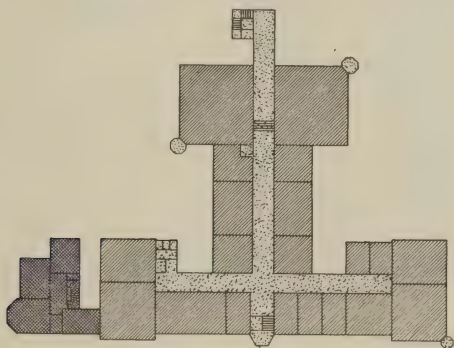


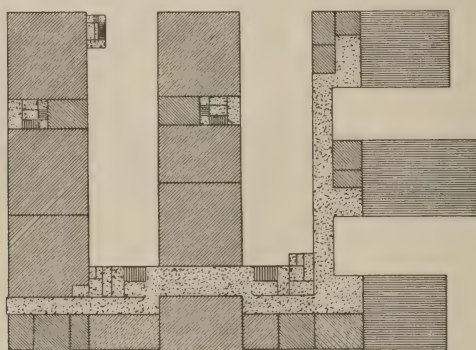
Plate IIa. School of Physical and Electro-Technical Science:
Ground Plan of First Floor.

Scale 1 : 1,250.

students residing under the parental roof at Delft or at neighbouring towns as The Hague or Rotterdam.



Plate III. School of Mechanical Technology, Applied Mechanics and Marine Engineering at Delft.



Comprises :

-  Workrooms for Head Master and staff.
-  Lecture hall.
-  Assembly hall.
-  Workroom for teaching.
-  House of the Head Master.
-  Collections.
-  Stairways, passages, corridors, sanitary installations, etc.

Plate IIIa. Ground Plan of the First Floor.

Scale 1 : 1,333 $\frac{1}{3}$.

The students may be classified as follows :

	1911/12.		1912/13.		Number of students who graduated in 1912/13.
	Male.	Fem.	Male.	Fem.	
Civil Engineering	391	1	422	1	47
Mechanical Engineering . .	264	—	269	—	36
Electro-Technical Engineering	179	4	186	5	26
Naval Engineering	36	—	43	—	5
Chemistry	204	29	220	41	22
Architecture	64	4	66	6	3
Mining Engineering	61	—	70	—	6
General Students.	67	19	74	29	—
	1266	57	1350	82	145

The number of architectural students would be considerably greater if it were not that Netherlands architects prefer to enter practical life early and so study elsewhere. These generally spend a considerable time in foreign countries, especially in Germany.

PROSPECTS. The initial salary of most State services varies from \$ 600 to \$ 800 per annum.

In the Colonies this salary is increased to \$ 1,440. At present the State service is less sought after, industrial positions offering better prospects. The Colonial Government has even been obliged to engage foreign engineers.

3. CIVIL ENGINEERING.

This is a five years' course, divided into two courses of two years and a final course of one year.

(1). *First two years' course.* This course covers mathematics, physics, civil engineering, architecture and drawing.

It leads to the first intermediate examination



Plate IIIb. School of Mech. Techn., Applied Mechanics and Marine Engineering. 5th year. Interior: Drawing-hall.



Plate IIIc. School of Mech. Techn., Applied Mechanics and Marine Engineering. Interior: Practical Training.

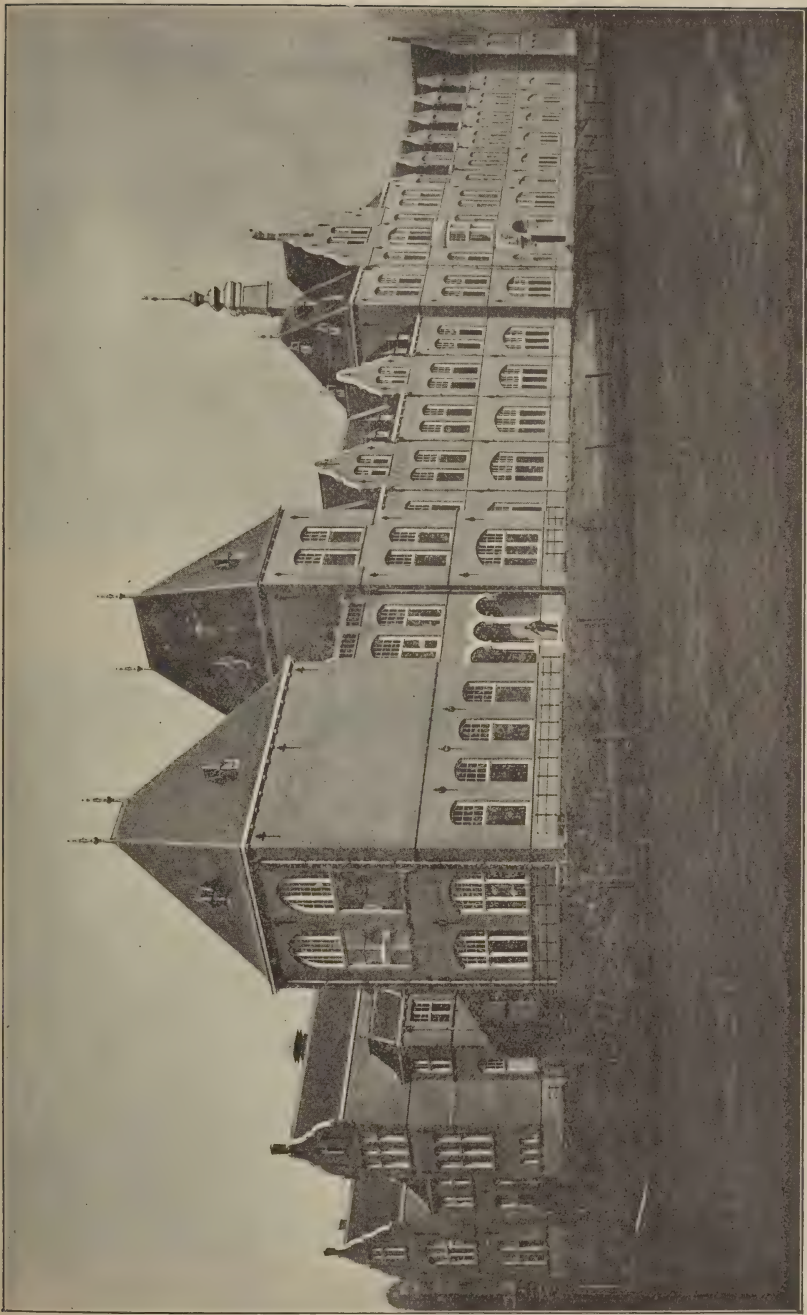


Plate IV. School of Mines

- (propadeutisch examen) ¹⁾. The examination is divided into a mathematical section, a section for physics, and one for architecture. The student may pass these at different times. The examinations are held twice a year.
- (2). *Second two years' course*. This course is divided into two sections, the first being chiefly theoretical, the second practical. It leads to the second intermediate examination, called *Candidaats examen*. Each section may be passed separately.
- (3). *Final course of one year*. This course is specially for instruction in drafting plans of harbours, canals, bridges, and irrigation works. Most of the lectures are optional. (Lectures 22 hours per week, exercises 15 hours).

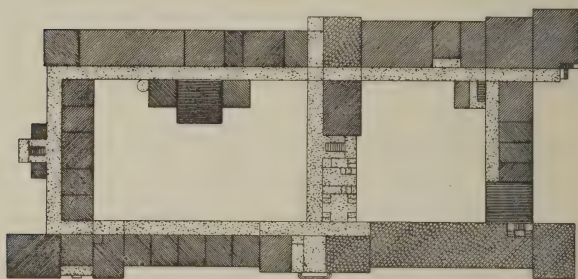


Plate IVa. School of Mines. Ground Plan of Ground Floor.

The final examination includes practical hydraulics, construction and exploitation of roads and bridges, surveying and levelling.

No preparatory practice is required before obtaining admittance to the University. Most students find employment on Government works as supernumerary surveyor

¹⁾ When the Polytechnic School was raised to a University, the academic custom was adopted of giving classical names to the examinations, though few of the teachers and scarcely any of the students are familiar with Greek or Latin.



Plate V. Drawing-hall for Mechanical Technology.

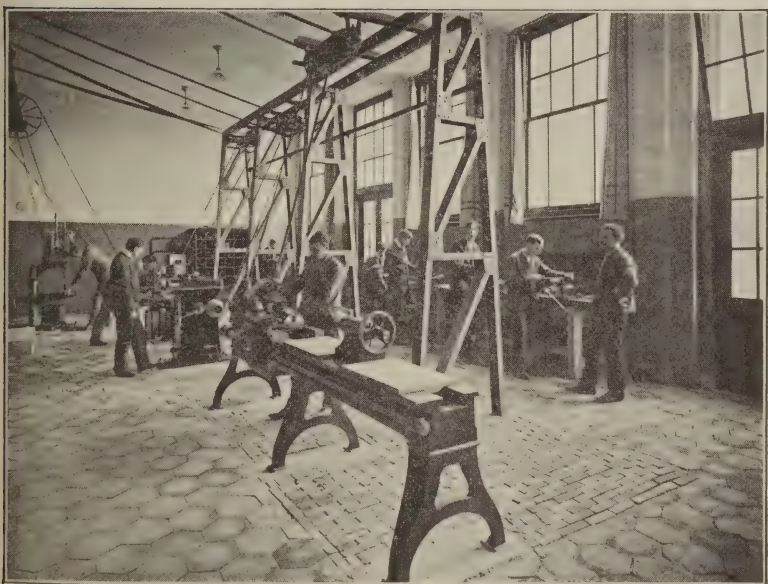


Plate Va. Laboratory for Mechanical Technology.

! (*buitengewoon opzichter*) during the summer vacation at a monthly salary of \$ 24. This is the only practical experience they obtain during their College years, and it is quite optional.

Nominally, the course occupies five years. In fact an average of 6.4 years are passed at the University ¹⁾.

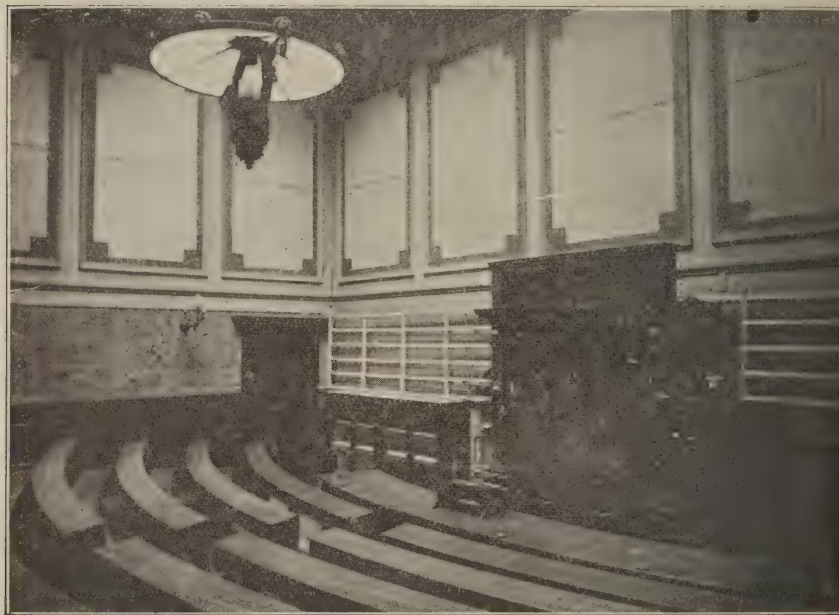


Plate VI. School of Architecture. Interior: Lecture Hall.

4. MECHANICAL ENGINEERING.

The instruction in this branch of science is given in two two-years' courses, and a final course of one year. Modern laboratories, built and equipped on a generous scale, enable

¹⁾ These details are taken from a booklet issued in 1914 by a Commission of students formed for the purpose of supplying information and hints on studying at Delft. No prospectus in the American sense giving full information is issued by the administration, only an annual program.

the student to acquire practical training. Specialisation is encouraged. The lectures in the first four years occupy 19 to 21 hours per week, in the fifth year, $14\frac{1}{2}$ hours; the rest of the time is devoted to experimental work. Statistics show that the students following this branch of study stay, on an average, 6 years at the University.

5. ELECTRO-TECHNICAL ENGINEERING.

The first two years' course is the same as for mechanical engineers. Special laboratories permit practical training in the second two years' course. The fifth year is chiefly devoted to drafting plans. The lectures cover 19 to 21 hours per week.

6. NAVAL ENGINEERING.

Mathematics and physics form the chief elements of study in the first course. Practical studies are gradually introduced. The lectures cover in the first four years 19 to 21 hours per week, and in the fifth year 14 hours.

7. CHEMISTRY.

Large laboratories, fully equipped, enable the student to obtain practical training. The lectures cover $16\frac{1}{2}$ to 20 hours per week. This branch of study is at present much in favour.

8. ARCHITECTURE.

The lectures cover $11\frac{1}{2}$ to $17\frac{1}{2}$ hours per week. In the first two-years' course considerable time is devoted to mathematics and physics. Though nominally five years suffice, statistics register an average of 7 college years.

9. MINING.

The first two years' course is almost identical with the course in chemistry. Practical elements are gradually introduced.



Plate VIa. Drawing-hall for Architecture.



Plate VIb. Interior: Geodetic Workroom.

10 THE BUILDINGS.

The total absence of love of display and the well-known parsimony of the Netherlands account for much in what will undoubtedly strike the foreigner in every academic town in the Netherlands. Instead of forming imposing quadrangles, the academic buildings are scattered at random throughout the town, and no well-kept lawns or stately avenues enliven the endless vistas of red brick.

The Technical University, though the seat of architectural learning, makes no exception to this rule. Moreover, as this institution has sprung from the Polytechnic School, which was erected in the nineteenth century, the older buildings lack architectural interest.

The most recent buildings are represented in plates I—VI.

Plate I. *School of Geodasy*. Built in 1892—1896, by the Government architect, Mr. J. VAN LOKHORST. Cost \$ 96,500. Cost per cubic yard \$ 3.08. This price was increased to \$ 3.88 by the installation of heating plant, water, light and furniture.

Plate II. *School of Physical and Electro-Technical Science*. Built in 1899—1903, by Mr. J. VAN LOKHORST. Cost \$ 312,850. Cost per cubic yard \$ 3.39. This price was increased to \$ 5.19 by the installation of heating plant, water, light and furniture.

Plate III. *School of Mechanical Technology, Applied Mechanics and Marine Engineering*. Built in 1904—1911 by the Government architect, Mr. J. A. W. VRYMAN. Cost \$ 496,100. Cost per cubic yard \$ 3.22. This price was increased to \$ 4.27 by the installation of heating plant, water, light and furniture.

Plate IV. *School of Mines*. Built in 1908—1913 by Mr. J. A. W. VRYMAN. Cost \$ 337,100. Cost per cubic yard \$ 2.66. This price was increased to \$ 3.85 by the installation of heating plant, water, light and furniture.

Plate V. *School of Mechanical Technology*.

Plate VI. *School of Architecture and School of Geodasy*.

CHAPTER III.

NETHERLANDS ENGINEERS IN FOREIGN COUNTRIES.

1. Introductory.
 2. Netherlands Engineers in France in Former Times.
 3. Netherlands Engineers in Other Countries.
 4. Netherlands Engineers at Suez.
 5. Netherlands Engineers in South America.
 6. Netherlands Engineers in Asia.
-

1. INTRODUCTORY.

The engineering career is popular in The Netherlands. Many engineers are, however, forced to seek employment abroad, the country being small. Netherlands engineers being familiar with the English, German and French languages, they are much sought after in foreign countries, where their thorough instruction, steadiness and integrity soon make them popular.

The total number of students graduated at Delft, who are still in active service, is 2,188.

Of these almost a third find employment abroad, 517 being at present engaged on works in the Netherlands Colonies, 111 in various European countries, 25 in North America, 26 in South America, 7 in Asia and 6 in Africa.

In ancient times Netherlands engineers were also famous in foreign countries. The reason is a peculiar one. The war of The Netherlands with Spain attracted the attention of the whole civilized world to the Low Countries. Young

noblemen flocked from everywhere to the Princes of Orange, in order to learn how to conduct sieges. Netherlands cities were not defended by huge masses of masonry, but were strong by reason of their position in the centre of moors and swampy land. The siege of a Netherlands town required the science of the civil engineer. Digging canals, draining the adjacent country, in order to be able to approach the town by trenches and to prepare the assault, demanded great engineer- ing skill. It is not surprising that foreign warriors, returning to their native country, spread the fame of the Netherlands engineers abroad, and that monarchs in every part of Europe invited these skilled men also for more peaceful purposes.

2. NETHERLANDS ENGINEERS IN FRANCE IN FORMER TIMES

HENRI IV of France called to his aid (1599) an engineer called HUMFREY, born at Bergen-op-Zoom, and soon afterwards France swarmed with Netherlands and Flemish engineers. Lakes near Arles, Tarascon and Carcassonne in the south of France were drained by Netherlands. Bordeaux named a street after the Netherlands engineer CONRAD GOOSSENS (1625) who delivered them from pestilential fevers by draining the adjacent moors. A polder on the banks of the Gironde is still called the Netherlands polder. Near Luçon is to be found *la ceinture des Hollandais*, a Netherlands dike constructed in 1643. On the Seine near Quillebeuf is a dike that is still called *la digue des Hollandais* (1618). When travelling from Paris to Brussels one can, by alighting at Compiègne, easily visit a polder of 2,300 acres, now famous for its vegetables, which was once drained and owned by Netherlands ¹).

¹) The Count of Dienne published extensive researches on Netherlands polders in France in his *Histoire du desséchement des lacs et marais de France avant 1789*. Paris, Champion, Guillaumin, 1891.

3. NETHERLANDS ENGINEERS IN OTHER COUNTRIES IN FORMER TIMES.

In England the Netherlander VERMUYDEN drained an area of 18,000 acres in the district of Hatfield Chase, between Doncaster and Goole. A large outfall drain, which empties in the river Ouse, is still known as the Netherlands river.

Many parts of northern Germany, Denmark and Sweden bear witness to Netherlands engineering skill, and as far away as Finland remains of Netherlands draining works are found. Schlüsselburg on the Neva is a Netherlands creation.

Even his Holiness the Pope did not disdain the services of Netherlands engineers, for in the seventeenth century CORNELIS MEIJER was called to Rome. The groynes constructed by him in the river Tiber, and his other engineering works in the Papal domains, are described in a copiously illustrated book called : *l'Arte di rendere i fiumi navigabili, Roma 1696.*

Among his disciples the most distinguished was LOUIS VAN WITTEL (LUIGI VANVITELLI), born in Rome but the son of CASPAR VAN WITTEL, a Netherlands painter. LOUIS excelled as an engineer and architect, and was employed in all parts of Italy. Travellers visiting Naples should not fail to make a journey to the town of Caserta. VANVITELLI not only built a magnificent palace there for the King of Naples (afterwards King of Spain) but also planned its cascades, which surpass those of Versailles. They are fed by perennial sources, which VANVITELLI led to the palace grounds on a huge aqueduct of masonry, a masterpiece of engineering skill.

4. NETHERLANDS ENGINEERS AT SUEZ.

The impulse given by the French Revolution, led all European nations to develop their natural resources. Staffs of native hydraulic engineers were organised everywhere. The Netherlanders were no longer needed, though their methods were eagerly studied and their works served as

examples. As, however, fresh countries opened to civilisation in Asia, Africa and America, and the fame of Netherlands hydraulics spread over the whole world, the Netherlands engineers found fresh fields of industry farther from home.

In the XIXth Century there flourished in The Netherlands a family of engineers of the name of CONRAD. Mr. FERDINAND DE LESSEPS, acting for Saïd Pasha, Viceroy of Egypt, invited one of these, Mr. FREDERIK WILLIAM CONRAD, a Chief Engineer of the Royal Waterstaat Corps, to be a member of the International Board established for the purpose of examining the practicability of a ship canal through the isthmus of Suez. Mr. CONRAD was elected president of this Board and shortly afterwards represented the Viceroy in the Company which undertook to execute the canal. He took a most active part in its proceedings. When returning to The Netherlands, after the opening of the canal (1870), the fatigue of the voyage proved too much for his declining health, and he succumbed en route.

The advice of Mr. CONRAD was much sought after. The Danish Government consulted him with regard to the canal planned to connect the Baltic with the North Sea through Holstein (the precursor of the actual Kaiser Wilhelm canal). The Hanseatic town of Hamburg invited him to prepare a plan for the drainage of Hammerbrock (1864). Mr. CONRAD was presented with the (English) Walker and Telford medals and elected a member of the English Institute of Civil Engineers.

A nephew of his, Mr. JOHN FREDERICK WILLIAM CONRAD, Inspector-General of the Royal Waterstaat Corps, became a member of the *Commission Consultative des travaux de la Compagnie maritime du Canal de Suez* and strenuously promoted the improvement of the entrance of the canal at Port Saïd. In 1879 he was elected a member of the International Congress for the Panama Canal.

Being a studious man, he formed an important collection of technical books. These were, after his death, incorporated in the library of the Leland Stanford Junior University (California).

5 NETHERLANDS ENGINEERS IN SOUTH AMERICA.

Mr. JOHAN ABEL ADRIAAN WALDORP, son of a well-known Netherlands painter, a Chief Engineer of the Royal Waterstaat Corps, left the service in order to devote himself entirely to his numerous foreign commissions. He planned a canal connecting Brussels with the North Sea, and a canal connecting the Donau with the Oder. Afterwards he went to Argentina (1881) where he planned the harbour of La Plata at Ensenada and supervised its execution.

His three sons, following his example, improved the harbour of Vera Cruz and Montevideo (Uruguay). They also canalized the Delta of the Parana.

Netherlands engineers — specially those of the Royal Waterstaat Corps — are frequently invited by foreign Governments to give advice on special questions. A striking example of the importance attached in The Netherlands to these honourable invitations, is the half year's leave granted to Dr. KRAUS, then Minister of the Department of Waterstaat, in order to enable him to give advice on the spot to the Chilian Government regarding important engineering works (Dr. KRAUS had formerly been consulting engineer to the Government of Chile).

Many other prominent Netherlands engineers settled in South America. Mr. LANGE is Director of Public Works at Buenos Ayres; Mr. VAN MOURIK BROEKMAN is Professor of Hydraulics at the University of Santiago (Chile); and Mr. DOYER is president of the Sociedad Central de Arquitectos at Buenos Ayres, &c., &c.

6. NETHERLANDS ENGINEERS IN ASIA.

Two of Mr. WALDORP's sons left South America some years ago for Asia Minor. Here they built the Anatolian railway (1898), improved the harbour of Haidar Pasha, opposite Constantinople, and planned the irrigation of the Konia plain, an area of 126,000 acres. This work was executed under their superintendence in 1903—1907. It was the first of its kind in Asiatic Turkey. In January, 1914,

Mr. ANTON WALDORP entered the Turkish State service as Director of the Department of Hydraulics at Constantinople.

The Japanese Government employed a great number of Netherlands engineers. Mr. DE RIJKE resided there from 1873 to 1903, improving the harbours of Mikumi, Kobe, Osaka, and the River Yedogawa. He was invited by China in 1876 to prepare a plan for the amelioration of the Whangpoo River (Shanghai). This work was partially executed in 1905.

In Siam a whole staff of Netherlands hydraulical engineers was recently employed on irrigation work. One of these gentlemen was Director-General of the Hydraulic Department.

The President of the Technical school at Bangkok is a Netherlander.

Even the British Colonial Government have sought advice from Netherlanders. Mr. DELPRAT (late Alderman of Amsterdam) was invited by the Government of India to give his advice on important Colonial works.

CHAPTER IV.

NETHERLANDS CONTRACTORS IN FOREIGN COUNTRIES.

1. Introductory.
 2. Contractors in South America.
 3. Contractors in France.
 4. Contractors in Spain and Portugal.
 5. Contractors in England.
 6. Contractors in Germany.
 7. Contractors in other parts of the Continent.
 8. Contractors in Asia and Africa.
-

1 INTRODUCTORY.

In the 19th century many Netherlands contractors acquired considerable wealth by executing an enormous amount of dredging for the amelioration of rivers.

In course of time most of these works were completed, and dredging plants could no longer be profitably employed in The Netherlands. These contractors then turned to foreign countries, where their experience enabled them to compete successfully with the native contractors, who until then had enjoyed a monopoly.

The Netherlands dredging plants worked more economically and soon became famous in all parts of the world, giving a new stimulus to the activity of the Netherlands shipbuilders, who specialised in the construction of dredging machinery.

2 NETHERLANDS CONTRACTORS IN SOUTH AMERICA.

Messrs. ACKERMANS and VAN HAAREN, and Messrs. DIRKS and DATES, residing at Buenos Ayres, executed

important dredging work in Argentina for the harbours of La Plata, Ensenada, Puerto, Belgrana, Ingeniero White, Bahía Blanca, Galvan, Cuatrecorcos, Santa Fé, Rosario, San Nicolas, Sorento and Quegen. Large dredging works are at present being executed by the *Sociedad Anonima Holandese de Obras Publicas* at Puerto Militar.

In Brazil Messrs. ACKERMANS and VAN HAAREN are contractors for the piers and dredging works near Rio Grande do Sul, in company with the French firm of FOUGEROLLE FRÈRES et GROSSELIER, for a sum of \$ 16,000,000.

In recent years some Netherlands firms have made reinforced concrete work their speciality. The *Hollandsche Maatschappij voor het maken van werken in gewapend beton* at The Hague, of which Mr. VAN HEMERT is the Manager, have executed important reinforced concrete harbour works in Chile. At present this company is constructing the harbour of San Antonio in combination with a French contractor.

2 NETHERLANDS CONTRACTORS IN FRANCE.

In 1876—1880 the French company of Fives-Lille received from the French Government \$ 0.44 per cubic yard for dredging work with a suction dredger at Dunkirk. Netherlands contractors were invited to compete, and executed the same work for \$ 0.18⁵ per cubic yard!

The same contractors also dredged at Calais and at Bordeaux. Messrs. ACKERMANS and VAN HAAREN executed, as sub-contractors, dredging work in the new docks at Havre for \$ 1,600,000. The dredging plant of Mr. VAN HATTUM of Beverwijk is also employed there.

The plant of Mr. KALIS of Slidrecht is engaged at Marseilles harbour.

4. NETHERLANDS CONTRACTORS IN SPAIN AND PORTUGAL.

Messrs. VOLKER and Bos dredged the harbours of San Sebastian, Aviles and Valencia; Messrs. KALIS the harbour of St. Esteban de Pravia. Messrs. Bos and HEYBLOM

contracted for dredging the river Odiël (Huelva). For the sum of about \$ 1,000,000 10½ million cubic yards of sand and mud were to be delivered into the adjoining moors by means of a pipe conduit.

In Portugese harbours Netherlands dredgers have also been at work.

5. NETHERLANDS CONTRACTORS IN THE UNITED KINGDOM.

Netherlands contractors have dredged successively at Jersey, Dublin, Grangemouth, Avonmouth, Immingham, Newport, Kirkcaldy, Swansea, Wick, Belfast and Port Talbot.

6. NETHERLANDS CONTRACTORS IN GERMANY.

In order to comply with the German law, Netherlands contractors formed companies with German names and invited German contractors to participate in their company.

In this manner the *Hanseatische Baugesellschaft* (Messrs. VOLKER, BOS, FICKE and Co.) was established. This company executed important works on the Weser for the city of Bremen, on the Elbe for the city of Hamburg, and for the German Government at Emden and at Heligoland, costing many millions of dollars.

The *Kölnische Tiefbaugesellschaft* (Messrs. TEN BOKKEL HUININK and SCHUHMACHER), the dredging firms of Messrs. VOLKER of Hilversum and Bussum, Mr. VAN HATTUM of Beverwijk, and Messrs. KALIS of Sliedrecht also executed important works for the Prussian Government and the free towns of Bremen and Hamburg.

At Magdeburg and Stettin the dredging firm of Mr. VAN DE VELDE of Dordrecht was employed. When the Kaiser Wilhelm Canal was dug, Messrs. VAN SETERS, BENNINK and SMULDERS did important dredging work as sub-contractors. The following five Netherlands dredging firms are engaged upon the present enlargement of this canal: The *Hanseatische Baugesellschaft* (already mentioned), The *Rheinische Tiefbaugesellschaft* (Messrs. VAN HATTUM of Beverwijk

and BLANKEVOORT of Haarlem), The *Maatschappij tot het aannemen van Waterbouwkundige Werken* (late Mr. THIJS VOLKER of Dordrecht), The *Maatschappij Nederland tot het aannemen van Werken*, of Bussum, and Messrs. VAN DE VELDE of Dordrecht.

7. NETHERLANDS CONTRACTORS IN OTHER PARTS OF THE CONTINENT.

Netherlands contractors have also dredged in Denmark and Sweden. In Russia important works on the Neva near Kronstadt and Petrograd were executed by the *Internationale Maatschappij tot het aannemen van Werken*.

In Belgium important works were executed in the harbour of Ostend, on the Scheldt near Antwerp and on the Canals from Brussels and from Ghent to the sea.

8. NETHERLANDS CONTRACTORS IN ASIA AND AFRICA.

In the German part of Africa, the *Bremer Baugesellschaft* (a Netherlands concern with a German name) executed dredging work for the German Government. Netherlands contractors have also laid considerable portions of the Delagoa Bay railway.

In Egypt Messrs. BOS AND Co. are engaged on the Suez Canal, while in China the *Netherland Harbour Co^y at Amsterdam* (a Netherlands concern) is dredging on the Whangpoo (Shanghai) for the Whangpoo Conservancy Board ¹⁾ and is constructing a harbour at Tsifoe.

¹⁾ For many of these particulars I am indebted to a paper by Mr. KEMPER, late Inspector-General R.C. of E., in the *Ingenieur* of 30 Aug., 1913, on "Netherlands Contractors in Foreign Countries".

APPENDIX

1. THE SECONDARY TECHNICAL SCHOOL AT DORDRECHT.

This school, but recently opened, is fully equipped with all modern improvements and is remarkable from an architectural point of view, having been built by one of our most renowned architects: Mr. EDUARD CUYPERS, a nephew of the famous architect of the Royal Museum and the Central Station at Amsterdam.

Some years ago a sum of \$ 133,000 was collected by the enthusiastic citizens of Dordrecht (the most ancient town of the Netherlands), for building and equipping a secondary technical school, for the instruction of youths of about fifteen years of age in mechanical, electro-technical and naval engineering. To these a course in sugar industry work was added, this being considered most important, as a large and steadily increasing number of sugar factories have been erected in the Netherlands Colonies.

The building was inaugurated in 1913. When entirely finished, the cost will be \$ 112,000, including the electric installation, etc. (Total area: 46,400 cubic yards, at a cost of \$ 2.43 per cubic yard, which the architect considers a very moderate sum for this kind of building).

The purpose of the school is to train managers and engine drivers or engineers (mechanics). No entrance examination is required when the pupil has successfully completed the third year of a Netherlands High School (this can generally be done at the age of 15).

After the second year the pupil is obliged to work for a year in a factory, a shipbuilding yard or a workshop. As a

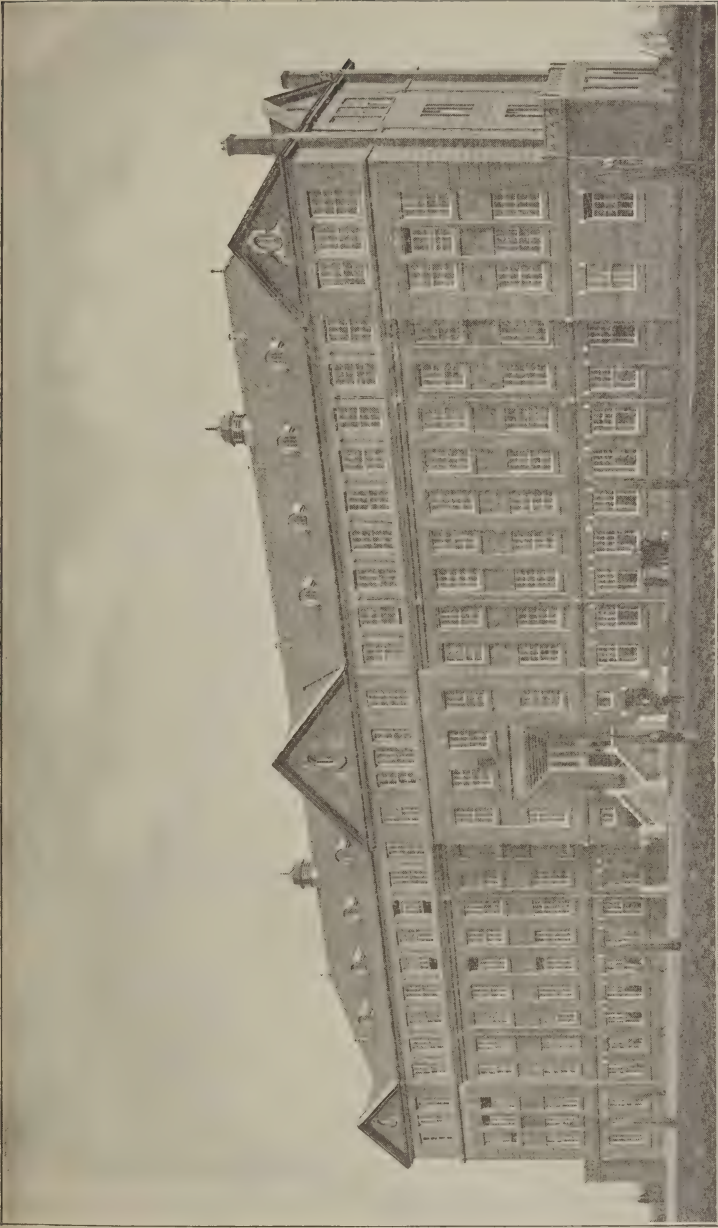


Plate VII. Technical High School at Dordrecht.

great number of Netherlands industrial companies favor this scheme, it is easy for the pupil to comply with this rule. When his shop or factory experience has proved satisfactory, the pupil returns to the school in order to complete his theoretical instruction in the final (third) school year, or what is in fact the fourth year of his studies.

It is calculated that the student will generally have finished his education at his twentieth year. At present the school has an attendance of 40 pupils in the first class, and 27 in the second class (1913/14). The practical course in the third year is followed by 16 students.



Plate VIIa. Technical High School, Dordrecht.
Drawing-hall for Naval Engineering.

The school being of very recent date, the annual expenses amount to only \$ 24,000. When in full working order, they will amount to \$ 32,000. At present it receives the following annual grants: from the State \$ 10,000, the Province \$ 1,840, and the town \$ 2,400. The fees are \$ 60 a year. Many pupils are admitted gratuitously.



Plate VIII. Technical High School, Dordrecht. Lecture-hall for Chemistry.



Plate VIIIa. Technical High School, Dordrecht. Weighing-room.



Plate IX. Arts and Crafts School at Arnhem

II. THE ELEMENTARY TECHNICAL SCHOOL AT ARNHEM (AMBACHTSSCHOOL).

Almost every town of any importance now boasts an elementary technical school. Since the abolition of the guilds — a consequence of the French revolutionary ideas — the technical skill of the artisans deteriorated hopelessly and nothing was done to stop this calamity. No apprentice contract, as is the case in Germany, protects the pupil against the greed of the employer or compels the master to instruct the apprentice in the secrets of his craft.



Plate IXa. Interior: Drawing-hall.

For this reason parents prefer to send their boys, financial circumstances permitting, to the *Ambachtsschool*, which in some aspects is a substitute for the apprenticeship.

The traveller will easily find occasion and opportunity of visiting some of the more important *Ambachtsscholen* at

The Hague, Rotterdam or Amsterdam. He will then be struck by the magnificence of the buildings, many being of very recent date, and the State liberally supporting these schools.

The *Ambachtsscholen* in smaller towns selected for this reason, are less showy, but give a fairer idea of the national trend. I have selected for this reason the Elementary Technical School at Arnhem. This city (64,000 inhabitants) is called the Netherlands paradise, its environs being the finest of the Netherlands and well worth visiting. It is also the capital of the Province of Gelderland.



Plate X. Interior: Carpentering.

The present Elementary Technical School was built in 1895. It belongs to a Society formed for the purpose. One of its members, the late Baron VAN VERSCHUER, was a patriotic citizen, and very active, notwithstanding the fact that he was totally blind. He provided the greater part of the necessary funds.

The building covers 4,320 square yards; the grounds

occupy about the same area. The cost was \$ 73,200, a comparatively small sum, doing credit to the architect's economical capacities. The number of pupils attending the school (1914) is 322, being less than formerly. The painter's trade has suffered in recent years, and few pupils follow this profession. Of these 322, 147 pupils learn the trade of the smith, 103 carpentry, 50 cabinet-making, 10 painting and 12 are taught masonry.

The pupil generally enters the school at the age of thirteen and the course takes three years.



Plate Xa. Interior : Masonry.

The annual fee is \$ 2 to \$ 20, according to the standing of the parents, but more than a third of the pupils are totally exempted from payment of any fee.

The total annual expenses are \$ 19,000. Of this sum \$ 16,924 is defrayed by grant (State grant \$ 8,520, Provincial grant \$ 1,792, Municipal grant \$ 6,400, and grant from neighbouring villages \$ 212).

III. NETHERLANDS CONTRACTS.

Netherlands specifications contain as a rule an exhaustive description of the work. Contractors have only to carry out these instructions, and all drawings are supplied to them.

No sum is deposited with the tenders, but the contractor must mention in the tender two persons of good standing as sureties. Any person residing in The Netherlands may tender. As a rule no special conditions are imposed ¹⁾.

The Government is not bound to accept the lowest or any tender. The work is, however, usually granted to the lowest bidder.

The contract generally covers the whole work. For example, if a house is to be built, the excavation, the foundation, the masonry, the woodwork, the plumbing and painting are included in the same contract.

The contractor often sublets parts of the work to specially qualified persons. He remains, however, responsible for the whole work, and all directions are given through his intermediation.

The contractor takes all risks. At his request, however, a board of arbitrators settles all disputes concerning:

- a. *The character of the work.* The board decides what is reasonably and obviously required for a satisfactory execution and completion of the contract. The cost of these works fall to the charge of the contractor.
- b. *The accounts.* The contractor is obliged to acquiesce in changes in the contract, to an amount of 10 % of the total sum. These are charged according to a tariff annexed to the contract.
- c. *Compensation for damages caused by exceptional circumstances.* The contractor is indemnified for the loss of material by storm, fire, etc. if he can prove his inability to insure them, and that the loss is not his own fault.
- d. *The exact moment at which an instalment is due.*

¹⁾ In this notice only Government contracts are considered. Corporation and private contracts are generally based on the Government conditions.

e. *The circumstances justifying delays in the execution of the work.* The board can reasonably extend the time stipulated in the contract for the completion of the work.

The board of arbitrators consists of three persons. One is chosen by the Department of Works, and another by the contractor. These two arbiters choose the third one. Their decision is final

The contractor is obliged to insure against accidents all persons in his service (directly or indirectly connected with the work) The temporary dwellings of the workmen must be in accordance with the hygienic rules laid down by the Department of Works. No person is allowed to work longer than 11 hours a day (breaks for meals, etc., not included). For night and Sunday work special permission from the Management is required. The rate of minimum wages is specified in the schedule of prices annexed to the contract.

All materials, when once on the grounds, are considered to be State property.

Though these general conditions (issued in 1901) differ considerably from the older ones and are more favourable to contractors, many parties concerned ask for still better conditions, especially because corporations and private persons are in the habit of copying the Government conditions in their contracts.

For this reason a powerful Society of Contractors, the *Nederlandsche aannemersbond*, in 1908 invited the *Society of Engineers Graduated at Delft* and the leading Netherlands Society of Architects (the *Maatschappij van Bouwkunst*) to collaborate and establish a set of conditions for general use.

The draft presented by a Committee of members of these societies is still under consideration (1914).

The Society of Contractors wishes to force the Management to accept the lowest tender when no special reason can be given for a different course of action. It also desires to substitute the personal sureties by the payment of a deposit of 10 % of the total amount of the contract.

EDUCATION
IN THE NETHERLANDS
1898

EDUCATION IN THE NETHERLANDS

BY J. C. LIGTVOET, FUNCTIONARY IN THE EDUCATION-
DEPARTMENT OF THE HOME-OFFICE.

EDUCATION IN THE NETHERLANDS

BY J. C. LIGTVOET, FUNCTIONARY IN THE EDUCATION-
DEPARTMENT OF THE HOME-OFFICE.

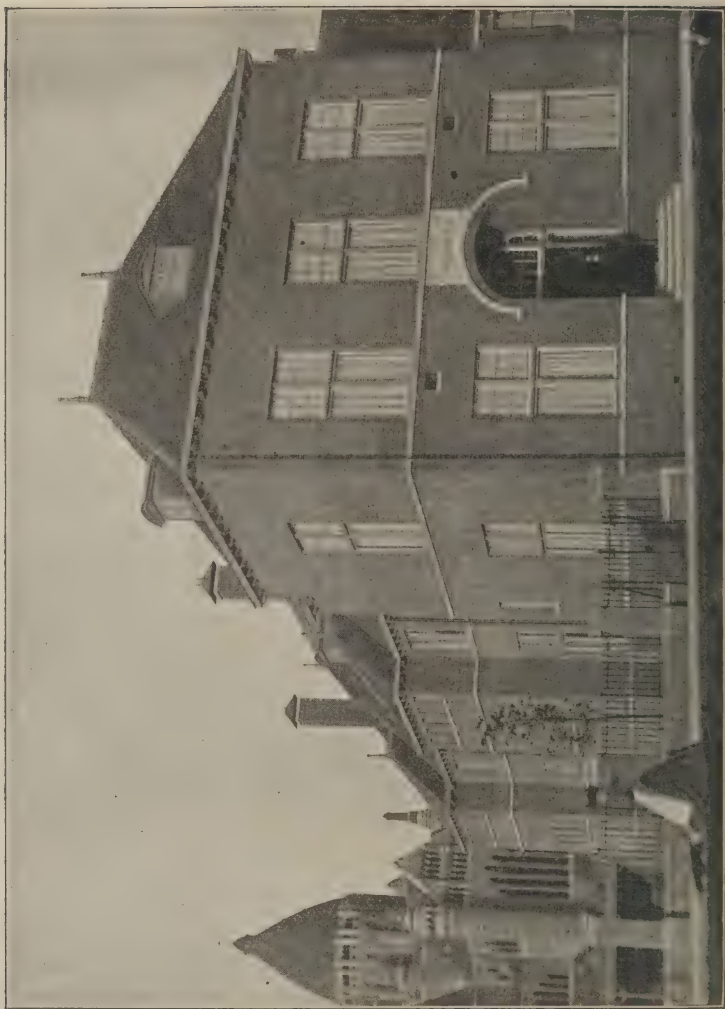
INTRODUCTION.

“PARENTS, guardians, and all who by virtue of law or agreement are entrusted with the care of children, are responsible for it that the said children, in so far as they are living with them, or under their care, or with them under the roof of others, be given an efficient elementary instruction during the years, and according to the rules, stated in this Act.”

Thus run the opening words of the first article of the “Compulsory Attendance” Act, that has been in force in the Netherlands since January, 1901. Since that time every young Netherlander, in so far as he is not physically or mentally unfit, is given a regular elementary instruction, from his 6th to his 12th or 13th year at the least. This instruction comprises: reading, writing, arithmetic, and an elementary knowledge of the Netherlands language, of national history, physical science and singing. To this are usually added the elements of drawing and, for girls, of plain needlework, which two subjects are also taught in elementary schools.

As schools have been established in every community where, for about 24 hours a week, at least these ten subjects are taught, we find very few illiterate people in this country. We may still find some among the old people, but they are dying out.

Elementary education is divided into ordinary (*gewoon*), higher elementary (*uitgebreid*) and yet more extended (*meer uitgebreid*) elementary instruction. We need hardly go into details here concerning the meaning of ordinary elementary instruction. It is the instruction given at the ordinary day schools, indispensable to everyone, no matter what his future career may be, and solely destined to furnish the



Public or undenominational elementary school at Harlem.

general education needed by the entire population without exception whatsoever. According to the law, this instruction should tend to develop the intellectual faculties of the children along with the Christian and social virtues, whilst teaching them the various useful accomplishments required. As a rule these schools have a 6 years' course.

Schools for higher elementary instruction usually have a seven or eight years' course; those of the wider elementary instruction one of nine years' duration. These latter schools have a more extensive program than the ordinary elementary schools. Besides the above-mentioned branches, tuition is there given in two or three foreign languages (French, German and English), and in mathematics and some other subjects besides, of which more will be said later on. These schools are for those who need more than the ordinary elementary instruction to prepare them for their career in life, whilst not requiring the wider course of secondary education. Hence they aim at a final education; they are, however, also attended by the future pupils of the high school, as the exact point of connection between the elementary and the high school has not been established by law.

Mr. THORBECKE, the father of the Secondary Education Act still in force today, defined the realm of higher education in the following words as far back as 1862: "If we consider elementary education as the instruction of the people, forming, as it does, the beginning of knowledge, and being destined for all alike, and higher education as destined for the small number of those preparing for a profession or employment for which a scholar's training is needed, then the intermediate realm of secondary education is for that numerous portion of citizens which is above elementary instruction, and strives for general knowledge and culture, preparing for the various professions of our busy social organization".

This wide realm comprises various kinds of schools providing a general education as well as for a more direct preparation for one or more trades or professions. The general education is given at the so-called "hoogere burger-scholen", high schools with a three and a five years' course



Private elementary school at The Hague.



Private elementary school at The Hague.
Corridor and stairs.

respectively. These schools provide the instruction needed for official Government posts, or for some commercial position, etc. The matriculation certificate of the high school with a five years' course, entitles the possessor to a continuation of his studies at the University in medicine, chemistry or engineering.

The real preparation for the study at a university, however, is given at the gymnasium (Latin or Grammar School).

Although special high schools providing a similar edu-



Private school at The Hague. First class.

cation exist for girls, we find that now-a-days many girl pupils attend the high schools originally meant for boys exclusively.

The more direct preparation for various trades also falls under the domain of this secondary education, where an earnest effort is becoming manifest to make theory go hand in hand with practise. This is especially evident in arts and crafts schools. The main purpose of these schools is

the making of workmen who thoroughly know their craft. Besides the practical training, which could formerly only be acquired in the workshop of the employer, the pupils are taught the theory of the trade, the so-called professional drawing; moreover, by way of continuation of what they learned in the elementary school, they get lessons in the Netherlands language, arithmetic, and mathematics. This sound pedagogy, which at the same time forms the man in the future craftsman, is followed in all schools preparing for some trade or other, or for agriculture, commerce, or navigation.

Once the years of elementary education are over, higher elementary education is not compulsory in this country. When the Compulsory Education Act was passed, an attempt was made to also include attendance at the continuation school, the so-called "herhalings-onderwijs", but this attempt failed. Every municipality was, however, charged to provide higher elementary schools.

ELEMENTARY EDUCATION.

Elementary education in the Netherlands is regulated according to the Act passed in 1878, which is still in force in its main point, however many alterations and additions it may have undergone on various matters of principle. According to that Act, every municipality has to furnish the opportunity of obtaining efficient elementary instruction, given by certificated teachers which the Town Council appoints. These are the "public" or undenominational elementary schools, open to all, and where the teacher is not allowed to teach, do, or allow anything that is not in keeping with the respect due to the religious principles of any sect. Besides these, we have the "special" or private elementary schools, established and kept up by religious denominations, societies, institutions, or private persons. Since the Constitution was revised in 1848, teaching in this country is free, except for the control of the magistrates regarding the capability and the morals of the teachers. Up to that time administrative permission was needed for the institution of



State training-college for teachers at Harlem.

free and financially independent schools, which permission was not easily obtained. In those days the magistrates were even too strict. No trace of that fear for the freedom of teaching remains. Today we find the private (usually denominational school) and the "public" or undenominational school side by side everywhere; they have about the same curriculum, and the staff of the private schools has to come up to the same standard of efficiency as that of the undenominational school. If a private school teacher should spread any doctrines tending to the corruption of morals, or inciting to disobedience to the laws of the land, his authorization to teach can be taken from him.

In 1913 this country numbered 3,322 undenominational schools for elementary education, with 562,125 pupils, and 2,199 private schools with 381,081 pupils. This means a total of 5,521 elementary schools, with 943,206 pupils. The total number of inhabitants in the Netherlands at the end of that year was 6,114,302.

Instruction was given at all these schools, during at least twenty hours a week, in :

- (a) reading,
- (b) writing,
- (c) arithmetic,
- (d) the rudiments of the Netherlands language,
- (e) " " " national history,
- (f) " " " geography,
- (g) " " " physical science,
- (h) singing,
- (i) the first exercises in freehand drawing,
- (j) callisthenics and gymnastics, and
- (k) plain needlework for girls.

Private schools need not include in their program the subject mentioned under (j). Undenominational schools can obtain a dispensation from teaching it for a maximum each time of five years.

At many schools, undenominational as well as private, tuition in one or more of the following subjects is also given :



State training-college for teachers at Harlem. Physical lesson.

- (*l*) the rudiments of the French language,
- (*m*) " " " " German language,
- (*n*) " " " " English language,
- (*o*) " " " general history,
- (*p*) " " " mathematics,
- (*q*) freehand drawing,
- (*r*) the rudiments of agriculture,
- (*s*) " " " gardening,
- (*t*) gymnastics, and
- (*u*) fancy needlework for girls.

The governing body, either of the undenominational or of the private school, is absolutely free in its choice of the abovementioned optional subjects. The local needs and wishes are of course always considered. In agricultural and gardening centres subjects (*r*) and (*s*) will be included, whilst near the frontiers and in the centres of population foreign languages and mathematics will be preferred. The denominational private schools include the religious teaching with the obligatory branches, whilst some schools, undenominational as well as private ones, teach over and above the obligatory subjects manual work (*Slöjd*).

At the primary schools, instruction is given according to a curriculum previously drawn up by the head of each school. That of the undenominational school is subject to the authorization of the Town Council and of the district inspector; that of the private school does not need any authorization, it is simply reported to the Board for State control of schools. A time-table of the lessons and the distribution of the various subjects over the school hours is hung up in every school. The principal of an undenominational school is bound to see to it, in regulating the schoolhours, that the children can at certain hours attend the lessons in religion given by religious instructors, which latter do not belong to the staff of the school.

As we have already said, the curriculum of the primary school, besides the obligatory subjects of elementary education, can also include the teaching of the optional branches given under (*l*) to (*t*). Wherever a high school education was available, the legislator meant the elementary school to

confine itself to the subjects (*a*) to (*k*), and *casu quo* to teaching the pupils so much of the French language as they need for their entrance examination, at the age of 13 or 14, into the high school or the gymnasium. At many elementary schools, however, especially during the last ten years, the curriculum has been so much extended, within the limits of the law, that they can no longer be reckoned among the elementary schools. These schools, which have acquired a place of their own in the education system, differ from the others in three points: (1) the branches in which tuition is given, (2) the years their course numbers, and (3) the final aim of the schools.

At the start, the subjects are those of the ordinary elementary school, but after the six years' course of the elementary school, this instruction is continued in a three years' course, especially instituted for the purpose and including instruction in two or three foreign languages (French, German and English), and in mathematics. Here the not very marked line between primary and secondary education is often very nearly approached. As the teaching at these schools is not, as at high schools given by special teachers for every branch, but by class teachers, the M. U. L. O. (More Extended Primary Education) school is much frequented by pupils who would otherwise receive their final education at a high school with a three years' course, but for whom that school, for pedagogical reasons, is less advisable. From this we see that the "M. U. L. O." School is not only meant for pupils for whom primary education is an inadequate preparation for the social career, whilst they yet have no need of high school education, but also for those who are not so intellectually developed as to be able to follow the high school course. Future minor officials, employés in commercial offices, etc., receive their general education at this kind of school, of which our country in 1913 counted 547 altogether, viz. 227 public or undenominational and 320 private schools.

CONTINUATION SCHOOLS. (Herhalingsonderwijs).

The instruction given at continuation schools is for those pupils who, on leaving the elementary school, get no more school training. It is given in the evenings, and preferably in the winter months. The municipalities are bound to arrange a course of lessons during that period, which course must comprise 96 lessons. Literally speaking this education is no "repetition," as it is called in Netherlands, but rather a continuation of what was learnt before. It should cover at least four branches of instruction, among which at least two should be of the ordinary school curriculum. The other subjects are optional; the leader of the courses chooses them in accordance with the profession or trade of the pupils. This freedom in the choice of subjects enables these evening schools to adjust themselves to the practical needs of life, especially in the towns, where the large number of pupils allows of variously organized courses.

At many of these evening classes reading, writing, arithmetic, geography, the elements of political economy and freehand drawing are taught. For girls plain needlework is added as a rule, and, in some places, also machine-sewing, ironing, cooking, and washing. In agricultural or gardening regions care is taken that the pupils, after finishing the course, can profitably follow the agricultural and gardening winter courses, whilst in other places the evening classes prepare for the professional drawing school, or for the technical training of future artisans and craftsmen. There were 47,640 pupils of these evening classes in January, 1913, viz., 39,958 in undenominational evening schools and 7,682 at private evening schools.

INSTRUCTION IN HANDICRAFTS.

"What is to be done next?" is the question many parents and guardians put to themselves when, at the age of 12 or 13, the children leave the elementary school. This question is of moment to the lower middle class, but no less to the poorer classes.

Some fifty or sixty years ago, when such children left the primary school, it was the custom to send them out into the world to earn their own living without in any way preparing or training them for some trade or handicraft. Now-a-days even the lower classes recognize that for children of 12 or 13 the time for learning is by no means over, that on the contrary it is the very time when they need to be trained for the work that awaits them in the world.

Fortunately, this need of being trained for trade or craft can be met. Curious to say, the arts and crafts schools in this country are not in their origin a Government concern; they were established on private initiative. This gave them the advantage that they were not bound to established regulations and rules in their development, but could easily adjust themselves to the needs of practical life. The lack of funds, however, proved to be a great obstacle at first. Gradually the general interest grew and contributions and subsidies from local and provincial boards came in. The State did not lag behind, but gave advice and financial help. Government subsidies were granted, and in 1899 a special bureau of inspection was established for the arts and crafts schools. Owing, to a large extent, to the expert guidance of the present inspector, Mr. H. J. DE GROOT, this instruction has been greatly developed. Arts and crafts schools were established everywhere and the existing ones were reorganized, so that now even the smallest towns provide well-appointed schools where young men can render themselves proficient in whatever trade they prefer. If their attendance at these schools necessitates a railway journey, they can obtain reduced tickets from the railway companies.

Only those who can prove that they have successfully finished at the elementary school, can enter the craft schools. The candidate should be between 12 and 16 years of age, and physically fit for the trade he chooses.

In contrast to the special professional schools, more than one trade is taught at the craft schools. At most of them theoretic instruction is given in drawing, the knowledge of materials, tools and instruments, in construction, physics, the Netherlands language, arithmetic and mathematics. These

last four subjects form a repetition and continuation of what was taught at the primary school, so as to contribute to the further general development and to aid in practical life as well. Moreover, the problems in arithmetic and geometry are derived as much as possible from the trade of the pupil.

Practical instruction is also given. Special care is taken here to render the workroom of the school as much as possible like the well-appointed workshop of an employer.

As a rule, the course takes three years. Pupils who have followed this course with success, are given a testimonial accordingly. Many large institutions or influential employ-



Craftschool at Amsterdam.

ers demand such a testimonial of their hands before appointing them. The school has then laid *the foundation* for the making of the craftsman. The routine of the expert and the greater handiness can of course be only acquired through experience.

As we said before, more than one branch is taught at the craft schools. At many of them the instruction comprises carpentering, painting, forging and turning. At some also the trade of mason, cabinet making, instrument making, typography, electrotechnics, etc., etc., are taught.

Special professional schools exist, however, where the instruction is organized on the same lines as at the craft schools. Others, again, have a slightly different character. At these latter the lessons are only given in the evenings, to young men who during the day-time work for an employer. This instruction also is theoretical as well as practical; it is given, however, at certain periods, regulated according to the requirements of the trade the pupil works at. In view of this, the duration of the courses at these professional schools varies greatly. Such schools exist for tailors, shoemakers, upholsterers, compositors, hairdressers, and textileworkers.

The pupils pay a fee at the craft schools as well as at the special professional schools. For the poor an exception can be made.

On December 31st, 1912, these schools numbered altogether 7,904 pupils, of whom 1,517 paid no fees. The age of these pupils varies mostly between 12 and 18 years. On the date mentioned above, 620 pupils were 18 or older; 1,802 pupils who left after completing the entire course, received the certificate. The subsidies amounted to: f 648,453 from the State, f 152,457 from the provinces, and f 434,522 from the municipalities.

Besides the craft schools and the professional schools, schools for professional drawing have been instituted everywhere. Here, instruction is given in the evening, in professional drawing, to which is often added a theoretic instruction, organized according to the special local requirements.

The most powerful impulse towards these institutions was given by the boards of the trade unions, for their apprentices. Professional drawing is taught at these schools, whilst for the further general development of the pupils continued tuition is given in the Netherlands language, arithmetic and mathematics. Many of such institutions very much resemble the so-called "Burger-avond-school" (middle-class evening school) where the instruction is also organized so as to meet the requirements of the trade. At the end of 1912 there were 282 of these professional drawing schools in the country, with a total of 17,393 pupils.

Although we see from the foregoing that the teaching

at the arts and crafts schools is built up, theoretically as well as practically, on the foundation laid by the primary school, this was not the intention of the legislator who drew up the Secondary Education Act. His idea was that the "future craftsmen and farmers" should get their general training at the so-called middle-class schools, that were to be day as well as evening schools. The law obliges every community of more than 10,000 inhabitants to maintain at least one middle-class day or evening school. A dispensation can be got from the obligation of keeping up a middle-class day school, however. With these day schools the legislator missed his aim; they were above the standard of those they were meant for. The consequence was that, after finishing the course, the pupils considered themselves too good for the trade and preferred some administrative post. Gradually, therefore, these few middle-class day schools were converted into a different kind of educational establishment, usually into high schools with a three years' course.

The middle-class evening schools were better adapted to the needs of the craftsman, which is probably due to the fact that these schools were free in the choice of their curriculum, which was imperatively prescribed in the case of the middle-class day schools.

As a rule, the pupils at the evening school are taught the Netherlands language, arithmetic, mathematics, physics and mechanics, line and professional drawing. With this curriculum these schools have ensured the lasting interest of young craftsmen and artisans. In 1912 instruction was given at 48 middle-class evening schools, mostly in co-operation with the technical schools. The authorities facilitate this co-operation as much as possible, as it involves an immense economy of working expenses, by means of a joint use of the educational apparatus. One course lasts as a rule from six to seven months; the entire schooltime varies between a two and a five years' course. In December, 1912, they were attended by 6,923 pupils, 6,425 of whom were already working at some trade. That year saw 958 pupils pass the final examination. All these middle-class evening schools were endowed by the State.

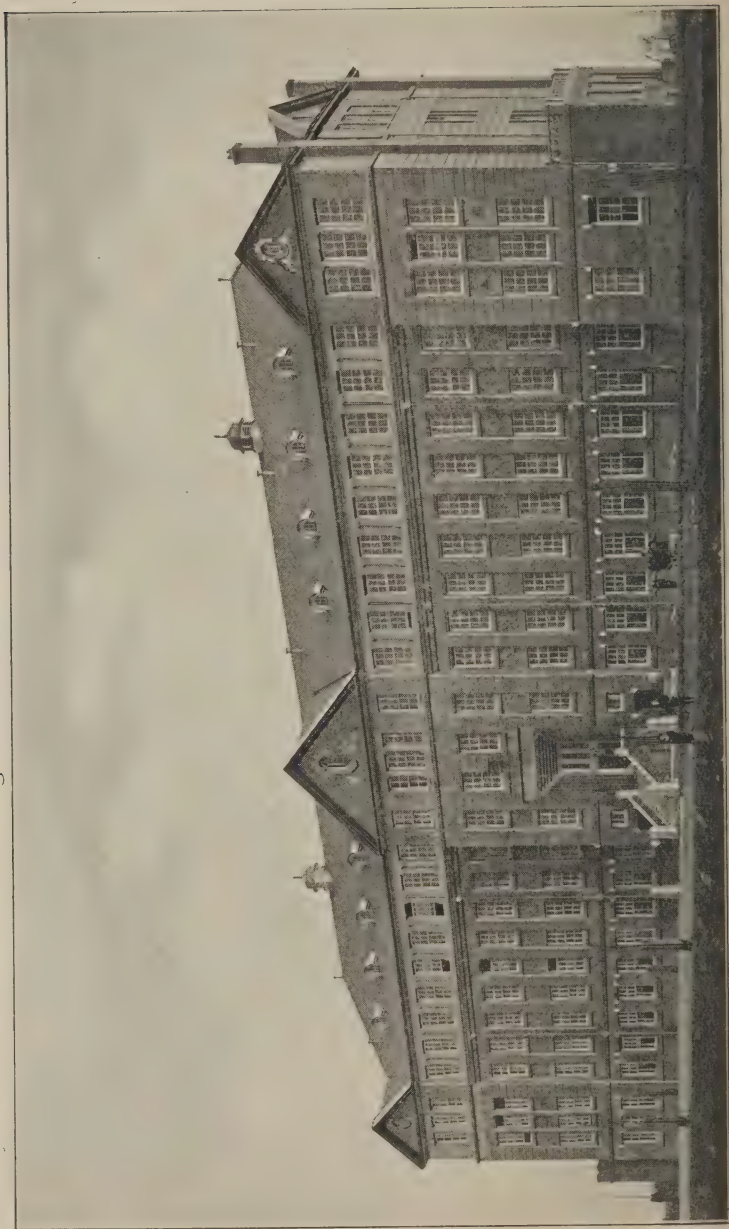
SECONDARY TECHNICAL SCHOOLS.

The above-named craft and professional schools, destined as they are for the making of capable artisans, do not provide a sufficient training for those who are to superintend the ordinary workmen, or to act as elaborators and executors of their superiors' projects. The training of these foremen and builders, who stand between the workmen and the scientifically-trained engineers from the Technical University, is only in the commencement stage as yet. During the last few years, however, technical secondary education has strongly developed. Here also much is due to private initiative, which formed so important a factor in the development of technical education. This has been especially marked since in 1904, under the KUYPER ministry, the Government manifested an interest in the question by projecting the establishment of a central secondary "technicum". Though these projects were not realized, they led to the founding of various secondary schools for technical education. In general that education is organized on the principle of decentralisation.

There are, for instance, the big technical schools at Amsterdam, for electrotechnics, mechanics and the sugar industry, and that of Dordrecht, where these same branches, plus naval architecture, are taught, as well as the textile school at Enschedé, the centre of the textile industry, where factory managers are trained. The schools of Harlem, Sneek and Utrecht provide a secondary technical education in the building trade, whilst at the secondary school at Bois-le-Duc a technical art education is given. Secondary technical schools have also been established at The Hague and Rotterdam.

From the very beginning there was a difference of opinion regarding the requirements of the entrance examination, and regarding the question whether a practical or a theoretical preparatory training was most needed.

The difficulty was solved by admitting pupils with a mainly theoretical, as well as those with a practical preparatory training. In connection with that fact every group is, if need be, made to work after a program of its own during the first few years. We see from this, that these schools are by no



Technical High School at Dordrecht.

means a continuation of the craft school. Pupils with a third form high school education, or its equivalent, can successfully follow the courses of the secondary technical school. In order to combine the theoretical and the practical preparatory training, an attempt is made at some of the craft schools to organize theoretical preparatory courses for the future pupils of the secondary technical school.

The Schools of Amsterdam and Dordrecht have a three years' course. During the first two years the instruction is mainly theoretical; during the third year the professional training predominates. After the second year the pupils must work during one year as workman in a factory or large workshop. If at the end of the course they successfully pass the final examination, they are given the final testimonial.

The secondary technical school for the building trade, at Utrecht, has a course of two and a half years. At the schools also the teaching is theoretical as well as practical, and leads up to a final examination.

We have already said that these schools owe their existence to private initiative. The State, the province and the municipality subsidize them, and supervise the curriculum and the range of instruction. For the rest the expenses are covered by the fees which the pupils are charged, and by the financial contributions of various patrons.

HIGH SCHOOLS.

The High Schools occupy a very important place in our system of education. They are a continuation of the elementary education, providing a general education culture, as well as preparing for various official posts, and callings, and for posts in industry, agriculture, commerce, etc. This is why so many pupils from all ranks of society prefer these schools. The Secondary Education Act of 1863 called them into life. In 1865 they numbered 1,418 pupils, and in ten years' time that number was doubled, so that at the end of 1875 the high schools counted 3,847 pupils, whilst in 1895 this had increased to 7,291, and at the end of 1912 to 13,309.

The law divides the high schools into schools with a

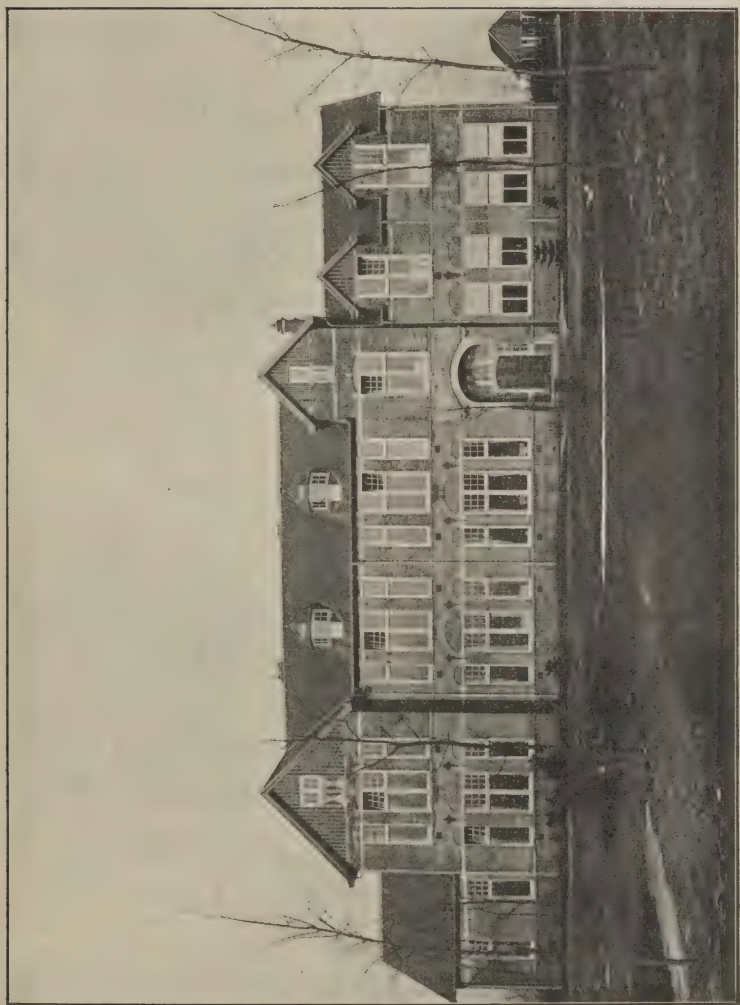
three and a five years' course. Both schools were to give the same instruction during the first three years. This aim, however, was not attained. The first three forms of the high school with a five years' course do not form a complete whole in themselves; they are arranged with a view to the continuation of a fourth and fifth year. The third form of the three years' high school, however, furnishes final instruction, which cannot possibly run parallel with the third year of the other schools.

At the high schools with a three years' course the law enjoins instruction in: mathematics, the elements of physics and chemistry, of botany and zoology, of political economy, and of book-keeping; geography, history, the Netherlands language, French, English and German, calligraphy, free-hand and line drawing, and gymnastics.

The tuition at the high schools with a five years' course comprises the following branches: mathematics; the elements of applied mechanics; the knowledge of instruments and of technology; physics and its main applications; chemistry and its main applications; the elements of mineralogy, geology, botany and zoology, and of cosmography; the foundations of the municipal, provincial, and State institutions in the Netherlands; political economy and statistics, especially of the Netherlands and her colonies, and her possessions in other continents; geography; history; the Netherlands, French, English and German languages and literature; the elements of commercial science, including knowledge of wares and book-keeping, calligraphy, freehand and line drawing and gymnastics.

Even on a superficial comparison of the branches at the respective schools, we see that a high school with a five years' course is absolutely different from one with a three years' course plus an additional two years.

The law does not exact entrance examinations. As a rule, though, the pupils are only admitted after having passed an examination. If, however, the candidate is provided with a written declaration from the principal of his former elementary school, stating that he (or she) is qualified to follow the instruction at the high school, the



State high-school with three years' course at Coevorden.

entrance examination can be partly or entirely dispensed with. As numerous municipal and special high schools exist by the side of the State high schools, there is no generally binding order as to this question. The municipal and special high schools have been formed and are governed by private institutions and incorporated societies.

At many schools the promotion to a higher form requires a removal examination, but here also no uniformity exists.

As the tuition at the high schools with a five years' course has been organized with a view to an officially instituted final examination, for which one universally binding program has been fixed, the tuition at these various schools is very much alike, whether they be State, municipal or private schools.

The final or matriculation examination is public, and conducted by a specially appointed commission in every province. It comprises all the above-named obligatory branches of the five years' course, with the exception of calligraphy and gymnastics. In the opening clause of the examination programme the purpose of these examinations is expressed as follows:

"As the purpose of the final examinations is to find out whether the young people that go in for them have successfully followed the five years' course of a high school, or some equivalent course of instruction, the principal aim of the high school, namely, the forming of enlightened persons, possessing all the accomplishments required of the cultured man of today, should be kept most in view. The candidates must therefore be able to prove that they have by deep study acquired a sufficient foundation to prepare for any profession or calling, and that a many-sided development of their intellect enables them to profitably avail themselves of the experiences of practical life".

From this introduction to the matriculation program, stating the general aim of the five years' high school course, we see that candidates who got their tuition at other kinds of school are also admitted to this matriculation examination. The number of pupils from the high schools who went

in for it in 1912 was 1,227. Of these 1,037 gained the matriculation certificate, among whom 176 were girls; 190 pupils failed. In 1912, moreover, 128 pupils from other schools went in for the examination. Sixty-seven of them passed, and 61 failed.

Attempts have been made in the last few years to substitute these provincial examinations by school examinations; as long, however, as the present Higher Education Act remains in force the schemes of these advocates of examination reform cannot be realized.

For the high schools with a three years' course no *generally binding* programme of matriculation exists. These schools can therefore organize their curriculum in accordance with the local needs.

Although the high schools were originally meant only for boys, girls have been admitted to the State high schools since 1871. Since that time many municipal and special or private high schools admit girls too.

SECONDARY SCHOOLS FOR GIRLS.

Special secondary schools exist for girls that are often wrongly called high schools. The curriculum of these schools has not been regulated by the law; the legislator emphatically left this to their founders. Although the girls do not get a special training for any examination, save the matriculation examination of the school itself, many pupils manage after a short preparation to pass the examination needed for various posts. Numerous teachers at elementary or secondary schools, as well as at domestic science and cookery schools, many nurses, etc., received their training at one of these secondary schools for girls.

Those who were most fit, physically as well as intellectually, prepared for the matriculation examination of the high school or the gymnasium, in order to get admittance to the university studies. This had not been the original purpose for most of them; the general development at the secondary girls' school, however, led to a continuation of the studies.

At the end of 1912 there were a total of 17 of these high schools for girls. Most of them have a five years' course, including tuition in the Netherlands, French, German and English languages and literature; geography, history, political economy, political science, mathematics, physics, calligraphy, drawing, needlework, aesthetics, hygiene, book-keeping and gymnastics. Some schools still include tuition in shorthand, history of art, singing and theory of education, though no uniformity exists in this respect.

The matriculation certificate of a secondary girls' school gives no admittance to other establishments for higher education. Some preparation is required for that, as we have already mentioned.

TECHNICAL AND PROFESSIONAL SCHOOLS FOR GIRLS.

Quite another kind of instruction is given at the Technical schools for girls, and at the so-called Domestic Science and Cookery schools. These fall under the professional schools. At the technical schools for girls tuition is given in drawing, plain and fancy needlework, art needlework, lace-making, cardboard work and bookkeeping, along with a repetition and continuation of the elementary instruction. At the domestic science and cookery schools is taught: household work, washing, laying of and serving at table, bookkeeping, sick-nursing, the art of dressing wounds, physical science, and sometimes the nursing of babies too.

The total lack of proper regulations has led to years of absolute neglect of this instruction, a few commendable attempts of private institutions excepted. The first step towards a professional training for girls was taken in 1865, namely, the institution of a technical school for girls at Amsterdam. Not until eight years later was a similar school established at Arnhem; The Hague followed in 1876 and in 1885 Rotterdam. Twenty years were needed to call into life four technical schools for girls, all four resulting from private initiative. For a long time these remained the only ones of their kind. Now this educational branch has also been organized.

It is curious to note how this organization was arrived at from below, without any official decrees and regulations.

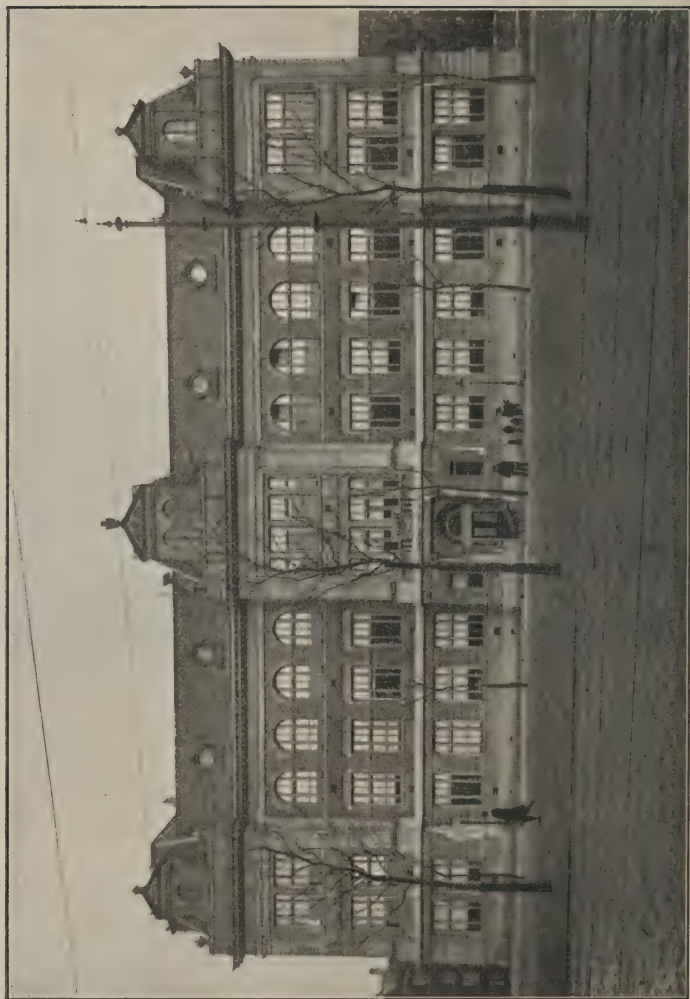
The technical schools for girls all form a complete whole in themselves, so that they enable the girls to render themselves useful in their own sphere. The instruction in plain and fancy needlework, however, is directed so as to prepare for the Government examination and the qualification to



Technical School for girls at The Hague.

teach in the said branches. In later years the program of some of these schools has been gradually enlarged with branches of domestic training, from which resulted the technical and domestic schools combined.

The difficulty of finding a qualified staff led to the establishing of courses for the training of teachers, which, as a rule, cover three years, though only a few schools give these courses. Most of them prepare for the post of housekeeper or lady's help, which training takes three years. The pupils must have finished the higher elementary school, and be at least 17 years old. If they pass the school examination, they get a testimonial. A registry office for qualified housekeepers



Commercial school with five years' course at Amsterdam.

helps in finding suitable posts, in hospitals, sanatoria, boarding-houses, boarding-schools, etc.

At several schools, too, the pupils can be trained as servants, whilst girls who already have a situation can render themselves proficient there in their free hours.

Nearly all these schools owe their existence to private initiative; they are endowed by the State, the Province or the Municipality. These endowments of course involve various conditions, so that gradually a fixed line is being drawn for the further development of this education.

COMMERCIAL SCHOOLS.

Whereas the elementary instruction forms a sufficient preparation for the technical schools, a more thorough training is needed for the commercial and agricultural schools. An efficiently organized commercial instruction was not arrived at in this country until the beginning of this century. Commercial schools existed in some of the larger towns, but these usually served the local needs only.

Later on evening courses were organized, by various societies of commercial and office employees, where book-keeping, foreign languages, and commercial correspondence were taught, but the pedagogic element was lacking in these courses. Now-a-days commercial instruction is given at numerous evening classes, and at special day schools. These latter generally form either a continuation of the high school with a three years' course, or represent the last two years of the high school with a five years' course, the three first years of which are given to the general high school instruction, while the last two are more especially devoted to commercial subjects. Since 1913, moreover, the Netherlands can boast of a Commercial University.

The evening classes can, of course, only provide elementary commercial education. These courses are given in numerous minor towns. They are frequented by young men who have had little more than the ordinary elementary tuition, and who already occupy some commercial post or

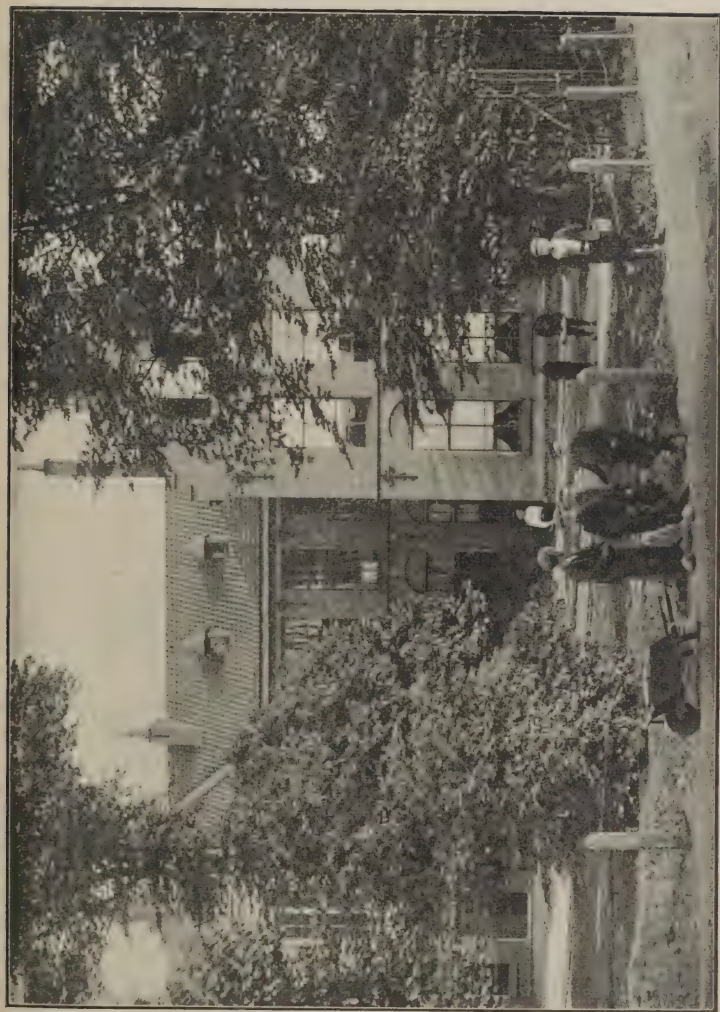
are employed as artisans. Tuition is given in geography, commercial geography, bookkeeping, commercial correspondence, the rudiments of commercial science, the knowledge of wares, and the rudiments of commercial law. Besides this, Netherlands and foreign languages are also taught, as well as type-writing and shorthand.

The evening classes are either municipal or private concerns; they are nearly all endowed by the State or the province, and, in so far as they are private, also by the municipality.

The more extended commercial instruction is given at the commercial day schools. These are of two different kinds: those based on a high school with a three years' course, and the special ones. Either of these includes a two years' course, the main subjects in the curriculum being: bookkeeping and commercial arithmetic, commercial law, general commercial knowledge, political economy, political science, the Netherlands, French, German, and English languages, and commercial correspondence, commercial geography and history, physical science and knowledge of wares. Optional subjects are, moreover, Swedish, Norwegian, Italian, Russian, Spanish and Malay. The instruction is of a generally educational character. A professional training, in the sense of miniature commercial offices, is not given. As with the commercial evening classes, these schools are kept by the initiative of private institution, and societies; they are State-endowed.

The Netherlands Commercial University is established at Rotterdam. It is directed by a private society and aims at giving a scientific commercial training in the widest sense of the word. No qualifications are required for attendance at the lectures, save that this can only be done by students possessing the high school or gymnasium matriculation certificate, or some testimonial equivalent to that. Ranged under five principal groups, the program comprises the following subjects:

Economy and Statistics; the Science of Trade; Jurisprudence; Economic Geography and History; and the Technical Sciences. This instruction is destined to complete the training



Commercial and industrial school at Enschedé.

of future commercial men, and of people destined for the leading posts in industrial and other trades. This university prepares, moreover, for the Consular service.

AGRICULTURAL AND HORTICULTURAL INSTRUCTION.

Like the commercial, the agricultural education is given in separate courses, as elementary tuition in agriculture and horticulture, to young men already working in that line. It is continued at secondary schools, and finally at the Higher School for Agriculture, Horticulture, and Forestry, a State establishment at Wageningen.

Agricultural and horticultural winter schools have been established by the State in numerous towns where young farmers and gardeners can, at small cost, acquire the theoretical knowledge their trade requires. This instruction is purely professional. The needs of the agricultural and horticultural calling in the province or region where the school lies, are always taken into account. The course takes two winters, whilst a few lessons are added in summer if need be.

Besides these State establishments tuition in agriculture, horticulture, and forestry is also given at private institutions, where foresters, keepers, surveyors and foremen are trained. Most of these courses owe their existence to the Netherlands Heather Company (*Nederlandsche Heidemaatschappij*). They have a two years' course, including theoretical and practical instruction.

The State Dairy School at Bolsward (*Friesland*) offers butter and cheese makers an opportunity of getting a professional training. Only those pupils are admitted who are well versed in the practical side of dairy work. The tuition is theoretical only, and consists of a two years' course, after which an examination is held and certificates are given. This, therefore, is purely professional education too.

The more general kind of agricultural instruction is given: (1) for Netherlands agriculture, at the Secondary Agricultural School at Groningen; and (2) for Agriculture in the Colonies, at the Secondary Colonial Agricultural School at Deventer. The Agricultural School at Groningen

is for pupils from some gymnasium, high school or extended elementary school, who want to prepare themselves for the practical side of agriculture. The Groningen school has a course of two and a half years, that of Deventer one of three years. For this school also, which more especially trains the pupils for practical life in the tropics, they need a few years of general education after leaving the primary school in order to pass the entrance examination. At both schools the instruction is theoretical as well as practical. Excursions are made, under the guidance of the teachers, to those museums and institutions which the pupils require to be acquainted with.

The scientific training of agricultural and horticultural teachers, etc., is undertaken at the Higher Agriculture, Horticulture and Forestry School.

NAVIGATION AND FISHERY SCHOOLS.

The maritime schools occupy a curious position. There are ten of them in this country, where young men, after the years of preparatory school attendance for their general instruction and a certain period (about one year) of deck service on board some sea-going ship, are trained for the mates' examinations that are held by a Royal Commission. These schools have courses for pupils who are quite new to the seafaring profession, as well as mates' courses for the coastal traffic and transatlantic navigation.

Some twelve Fishery schools provide the skippers, mates and engineers required on the fishing vessels.

GYMNASIUMS.

The gymnasiums or so-called Latin schools, where the comparatively small number of those who need a scientific training get the preparatory higher education, can hardly be reckoned under what we are used to call the establishments for the education of the people. In many points, however, they resemble the high school with a five years' course,



Gymnasium at The Hague.

though the gymnasiums have a six years' course. They provide tuition in: Latin, Greek, Netherlands, French, German, English, history, geography, mathematics, physics, chemistry and natural history. These are the obligatory branches for all Netherlands gymnasiums. Hebrew and gymnastics are optional.

The curriculum of the gymnasiums and all that further pertains to these institutions has been regulated by the Higher Education Act of 1876. Here uniformity reigns supreme. Curriculum, school hours and duration of the course are the same at all Netherlands gymnasiums. Instruction in the twelve obligatory subjects is given according to the following time-table:

SUBJECTS.	FORMS.							
	I.	II.	III.	IV.	V.		VI.	
					A.	B.	A.	B.
Latin	8	6	6	6	8	5	8	4
Greek	—	8 January (till 1st)	6	7	6	4	7	4
		5 January (after 1st)						
Netherlands	3	2	2	2	2	2	1	1
French	4	2	2	2	1	1	1	1
German	—	3	2	2	2	2	1	1
		January (after 1st)						
English	—	—	3	3	2	2	1	1
History	4	3	3	3	2	1	3	2
Geography	3	2	1	—	—	—	1	1
Mathematics	4	3	3	3	2	5	2	5
Physics	—	—	—	—	2	3	2	3
Chemistry	—	—	—	—	—	1	—	1
Natural History	2	2	—	—	—	2	—	2
Total number of school hours a week:	28	28	28	28	27	28	27	26

The pupils are admitted when they are from 12 to 13 years of age, after an entrance examination on the branches of ordinary elementary instruction and French. In the first form, no tuition is given in Greek, German, English, physics

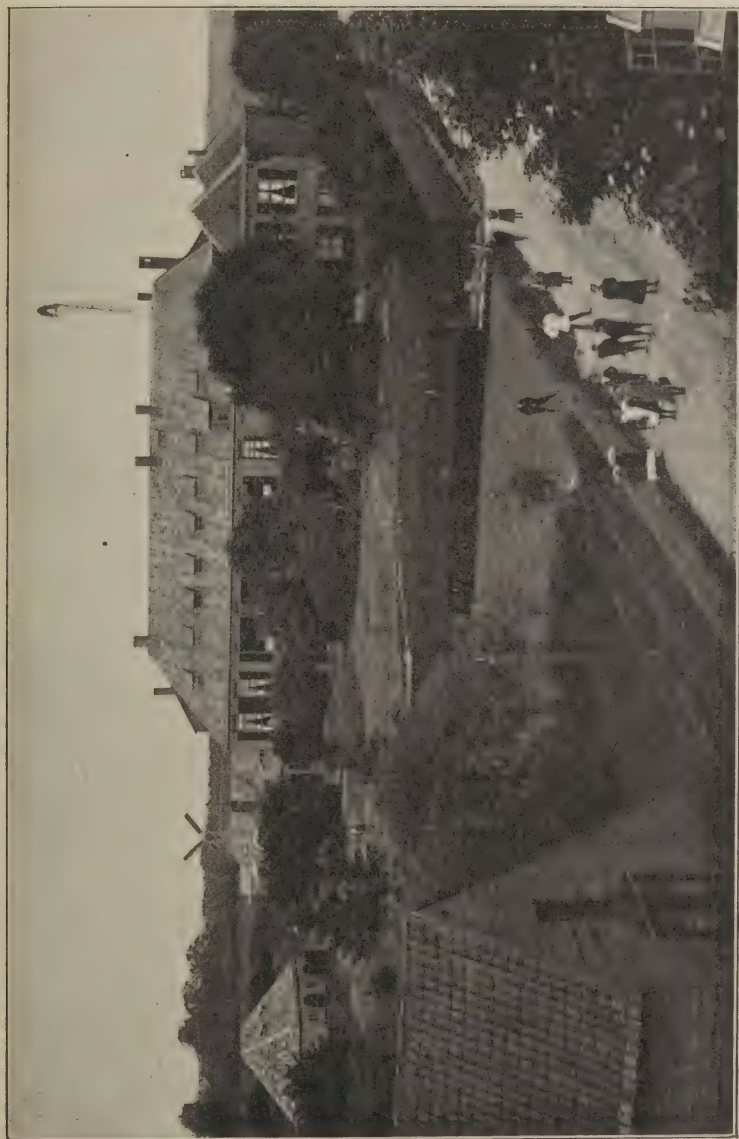
and chemistry. Greek and German are begun in the second form, English in the third. The tuition in Natural History is suspended in the third and fourth forms, and in form V it is only given to the pupils of division B. After the fourth year the pupils are divided according to their future studies. Those who wish to become theologians, literary men and lawyers, follow course A; those for medicine or physics go in for B.

When, at the end of the six years' course, the pupils pass the final examination, they get the certificate qualifying them for the university studies. This matriculation examination is held at each gymnasium separately, and conducted by its own teachers, in the presence of three State commissaries having the right of veto. The matriculation examination for future theologians, literary men and lawyers differs from that for the physical and medical faculties.

The tuition at the gymnasium is, as at the high school, given by special teachers for every subject. At their head stands the Rector, assisted by the Conrector, both having the university degree of doctor in the classics. The other teachers have either their degree, or a secondary education certificate for the branch they teach.

Every community of more than 20,000 inhabitants is obliged to have a public gymnasium. Exception from this obligation can be obtained. In 1913 31 communities had their public gymnasium. In that year, moreover, 15 private gymnasiums existed, instituted on the initiative of private institutions or recognised societies. If they come up to the requirements of the law, these private gymnasiums can also grant the certificate qualifying for the university. The 31 public gymnasiums numbered in 1913 2,636 pupils; the 15 recognised private ones a total of 1,594 pupils. In that year the matriculation certificate was granted to 249 pupils of public and to 131 pupils of private gymnasiums.

The public gymnasiums as, we have already mentioned, are kept up by the municipality, the private ones by the institutions or societies by which they are governed. The expenses are partly covered by the school fees (minerval),



Denominational training-college for female teachers at Zetten.

which at the public gymnasiums may not exceed 100 guilders a year for every pupil. Both the public and the private gymnasiums are State-endowed.

Besides these, there are also a few gymnasiums without the "jus promovendi", a few pro-gymnasiums and some Latin schools. These institutions of preparatory higher education are not bound to the curriculum set for the gymnasiums.

LEGISLATIVE REGULATIONS.

For the proper understanding of the education system in the Netherlands, we will conclude with a short survey of the legislative regulations made in this respect.

Seperate Acts regulate the elementary, the secondary and the higher education.

The Elementary Education Act places the elementary education of the nation under the charge of the local authorities; though private persons, institutions and societies are free to found and to maintain primary schools. The teachers at these private schools are subject to the same requirements, so far as qualifications and morals are concerned, as the undenominational school teachers. With a few exceptions the same subjects are taught at the public or undenominational as at the private schools. The curriculum is drawn up by the head of the school. For the undenominational schools this curriculum, and the list of books to be used, is subject to the approval of the Burgomaster and Aldermen of the place, and the Government inspection authorities. The private school has a greater freedom in this respect. With a view to the State endowment, however, the curriculum and the timetable should be sent in to the Government inspection authorities, so that it may be ascertained whether they meet the minimum requirements.

Only qualified teachers (of both sexes) can teach in the school. Pupil teachers can only work in the school under supervision. The teachers get a training of at least four years, at training colleges and so-called normal schools, which are either government, municipal or private schools. The

instruction there given prepares for an examination that entitles the successful candidate to a qualified teacher's certificate. The candidates must be 18 years or older. After two years of practical work as a teacher, they can go in for another examination entitling them to the certificate of head teacher. All these examinations are held in public. Every year the examination committees are appointed anew. At the head of every school there is a teacher of at least 23 years of age, and holding the head teacher's certificate. The number of assistant teachers varies according to the number of pupils in the school. If there are more than 40 pupils, there must be at least one assistant teacher, besides the head; for over 90 pupils two assistant teachers are required. Every 55 pupils over 90 require another assistant teacher. The maximum number of pupils at an undenominational school is 600. For the private school no maximum has been fixed. Lady teachers are chosen as a rule for the lower classes.

The staff of the undenominational elementary school is appointed and dismissed by the Council of the town where it is situated. These appointments are permanent; teachers may only be dismissed on the authorisation of the provincial government, against which appeal can always be made to the Crown. The staff of the State-endowed schools is appointed by the board of the institution or society governing the school. These appointments are also permanent. A temporary appointment at a private school can never be for more than one year. In case of dismissal, the teachers at the private schools can appeal to an impartial commission consisting of the governors and the staff of these schools.

The heads and the teachers of public or undenominational and private schools have a fixed yearly salary, which is raised from time to time. They are, moreover, entitled to old age and invalidity pensions. In case of pre-decease, their widows and orphans are also entitled to the pension.

The schoolrooms must be built and fitted out according to the regulations made by the authorities, and which are about the same for public as for private schools.

The cost of the establishment and operation of undenominational schools is paid by the Municipality, and that

of the private elementary schools by their governing boards. Both branches of the educational organisation receive an equal State endowment. Financially weak communities, for which these expenses for elementary education would prove too heavy, can obtain an extra endowment from the State.

In order to meet the cost of the undenominational elementary education, the municipality is bound to charge the pupils school fees. Paupers and those who come upon the parish are as a rule exempt from this obligation.

A regular attendance at school is encouraged by the authorities, by means of public prizes and rewards. The Compulsory Attendance Act prevents absolute as well as relative non-attendance.

The supreme inspection of elementary education lies with the Minister of the Interior, under whose direction it is carried out by three inspectors, 26 district school inspectors, and 128 "arrondissement" inspectors. The local supervision at every place is directed by the Burgomaster and Aldermen. The Town Council is authorized to appoint a permanent commission, to ensure regular local school inspection. All elementary schools, undenominational as well as private ones, are at all times open to this school inspection. The teaching staff is bound to give the inspectors all information regarding school and instruction that they may ask for.

The central organizations of private elementary schools, and especially denominational ones, have moreover instituted a special inspection service at all the schools belonging to the organization. This private school inspection is not authorized by the law.

As the establishment and operation costs of private schools can only be partially met from the State subsidies, and have to be covered by school fees and voluntary contributions, these schools have repeated financial troubles, far more so than the public or undenominational schools which are paid for entirely out of the public funds. In December, 1913, a Government Commission was appointed by Royal decree to inquire into what measures were to be taken towards a satisfactory solution of this difficulty, and towards ensuring an equal development of public or

undenominational and private elementary instruction. This Commission is expected to send in its report in a few months' time.

Secondary education is regulated by the Act of May 2nd, 1863. According to this Act, those subjects pertain to secondary education which are taught at the schools falling under the said Act.

The Act mentions: *Middle-class Schools*, divided into Middle class day and evening schools; *High Schools* with a five and a three years' course respectively; *Agricultural Schools*, and *Secondary Schools for Girls*.

Commercial schools, Naval schools, Craft schools and Professional schools are not mentioned.

No one is allowed to give secondary instruction who does not possess the qualifications of capability and morals required by the law. Moreover, foreign teachers need the Queen's sanction.

Teachers working at the secondary schools get the title of "leeraar" (teacher or lecturer). They obtain the qualification to give secondary instruction after passing the examination held by a Royal Commission, and comprising, besides professional knowledge, also the theory of teaching and education. The certificates to be had in the various branches of secondary instruction, are prescribed by the law. Those who possess a university degree of doctor in mathematics and physics, in mathematics and astronomy, chemistry, geography or mineralogy, zoology and botany, jurisprudence, political economy, or literature, are also duly qualified. The university examination of "doctorandus", and, for some subjects, of "candidaat", likewise qualifies for the giving of secondary instruction. The law states what certificates of qualification the teachers are to have for every subject.

The staff at the State schools for secondary instruction is appointed and dismissed by the Queen; that of the municipal schools by the Town Council, that at the private secondary schools by the boards of the institutions or societies governing them. The staff of all the State schools are entitled

to old age and invalidity pensions on the civil service basis. In case of pre-decease, their widows and orphans are also entitled to the pension. Equally entitled to their own, or to the widow's or orphan's pension are all teachers at municipal and private high schools, middle-class schools and secondary schools for girls.

The municipal and private schools get State endowment, on certain conditions, regulated by the law. A school fee is taken from the pupils, to partially cover the working costs.

The supreme inspection of the secondary schools lies with the Minister of the Interior. It is carried out under his direction, by Royal-appointed Inspectors and by local committees.

No legislation regulations for the so-called professional instruction exist in the Netherlands. The Government presented a Bill on the question in May, 1915. According to this Bill, Professional instruction shall be given at: (*a*) commercial schools, (*b*) naval schools, (*c*) fishery schools, (*d*) mining schools, (*e*) craft schools, (*f*) technical schools, (*g*) industrial schools, (*i*) schools for cookery and domestic science, and (*j*) at all institutions not mentioned under (*a*) to (*c*) that may by virtue of a Royal degree be counted as professional schools.

The curriculum and time-table of the State professional schools will be drawn up by the Home Minister, whilst for the curriculum and time-table of the municipal and of the State-endowed private professional schools general regulations will be made. Special certificates will be instituted, qualifying for the giving of professional instruction. Commissions will be appointed every year by the Minister, to hold examinations for the purpose.

As regards the State endowments to be given to the municipal and private professional schools, and the conditions these schools will have to comply with in order to obtain such endowment, the Bill mentions a few general regulations which will have to be worked out in detail by the executive power. The measure further contains various

regulations regarding the pupil system and some general regulations for the teaching contracts.

The Bill charges the Minister of the Interior with the supreme inspection of the professional instruction. It is to be executed under his direction by various inspectors. Local committees will, moreover, supervise the municipal and private professional education. The members of these committees will be appointed by the Town Council.

Transitional regulations will regulate the qualification of those who are teaching at professional schools when the Act enters into force, and who are not in possession of the certificates the Act requires.

It was not possible within the narrow space allotted to me to give a *complete* picture of the educational system in the Netherlands. This survey is necessarily brief. However, I hope I may have at least indicated that, as regards its national education, the Netherlands nation is active and occupies an honorable position among the cultured nations.

Appendix.

SURVEY OF THE AMOUNTS (IN GUILDERS) SPENT ON THE VARIOUS BRANCHES OF NATIONAL EDUCATION IN THE NETHERLANDS DURING THE YEARS 1900, 1906 AND 1912.

Branches of Education.		1900.	1906.	1912.
Elementary Education	State Expenditure	7,047,360	15,515,337	24,225,580
	Municipal Expenditure	12,835,288	10,534,260	14,266,017
	Total	19,882,648	26,049,597	38,491,597
Secondary Education	Government High Schools	562,479	744,806	933,134
	Municipal High Schools and Middle-class Schools	1,436,263	2,081,233	2,584,663
	Municipal Commercial Schools	78,355	147,380	209,887
	Municipal Secondary Girls' Schools	254,862	293,078	338,391
	Cost of Inspection and Examination	127,657	153,099	227,418
	Total	2,459,616	3,416,596	4,093,493
Professional Education	Technical and Craft Schools, Professional and Drawing Schools, Industrial Girls Schools, etc.: State Expenditure	682,638	607,322	1,427,339
	Provincial Expenditure	83,347	178,151	360,773
	Municipal Expenditure	373,311	565,141	1,369,617
	State Grants to Naval Schools	38,550	44,735	64,035
	State Expenditure for Agricultural Schools	375,176	503,885	827,160
	Total	1,553,022	1,899,234	4,048,924
"Gymnasium" Education	State Expenditure	236,682	267,755	414,565
	Municipal Expenditure	599,406	625,483	717,368
	Total	836,088	893,238	1,128,933

SCIENCE IN THE NETHERLANDS.

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State University at Leyden.

UNIVERSITIES IN THE NETHERLANDS

BY P. C. MOLHUYSEN.

INTRODUCTION.

THE aim of this booklet is to give a short account of the study of the sciences in The Netherlands, and to indicate the place which this country now occupies in the scientific world. Albeit the times are long past when The Netherlands was the centre whither came scholars and students from all parts of Europe to increase their store of knowledge, it does not content itself with an honourable past but endeavours to ensure for itself a good place in the peaceful rivalry of the nations and to show that a small land can in many respects be truly great.

In the following pages will be found, in the first place, a brief review of the nature of Higher Education in The Netherlands, of the gymnasiums and universities, the requirements which are made and the powers which are granted. Then follows a short review of the leading scientific societies, and of the aids to Higher Education and related branches. We then discuss, in order of the five faculties, the development of the different sciences which are taught in the High Schools, and the position of the study of these sciences at the present time, in so far as the scope of this booklet permits.

STATE University Education in the Northern Netherlands dates from the year 1575. It is true that in the latter part of the fifteenth century students of the Northern Netherlands transplanted Humanism from Italy to their native soil and here and there we see arise centres of a higher civilisation, as in the Cistercian abbey of Aduard, in Groningen, with which the names of WESSEL GANSFORT and RUDOLF

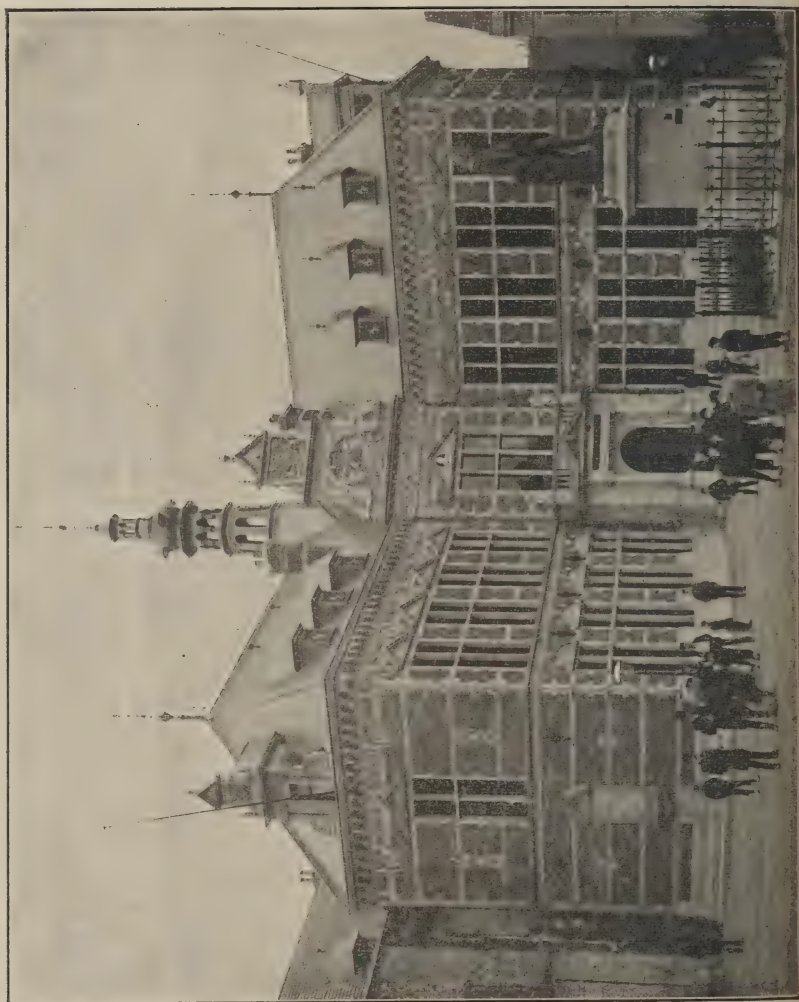
AGRICOLA are closely connected; and under the influence of the Brothers of Common Life the schools of Zwolle and Deventer became of greater importance, especially the latter, where ALEXANDER HEGIUS taught and where well-known Humanists, such as MURMELLIUS, GELDENHAUER, WILLEM HERMANZ of Gouda and our illustrious ERASMUS of Rotterdam had their first education; yet these schools cannot be called institutions for University education. Those wishing to receive a higher education or to take a degree, were always obliged to go to a foreign university: Bologna and Padua, Paris and Orleans, Marburg, Heidelberg, Cologne and Rostock, to mention but a few of the most frequented, counted among their students a great many from the Northern Netherlands. Those not wanting to go so far from home, went to the universities in the Southern Netherlands, to Douai and Louvain, until the Reformation closed these Universities to the greater part of the Northern students.

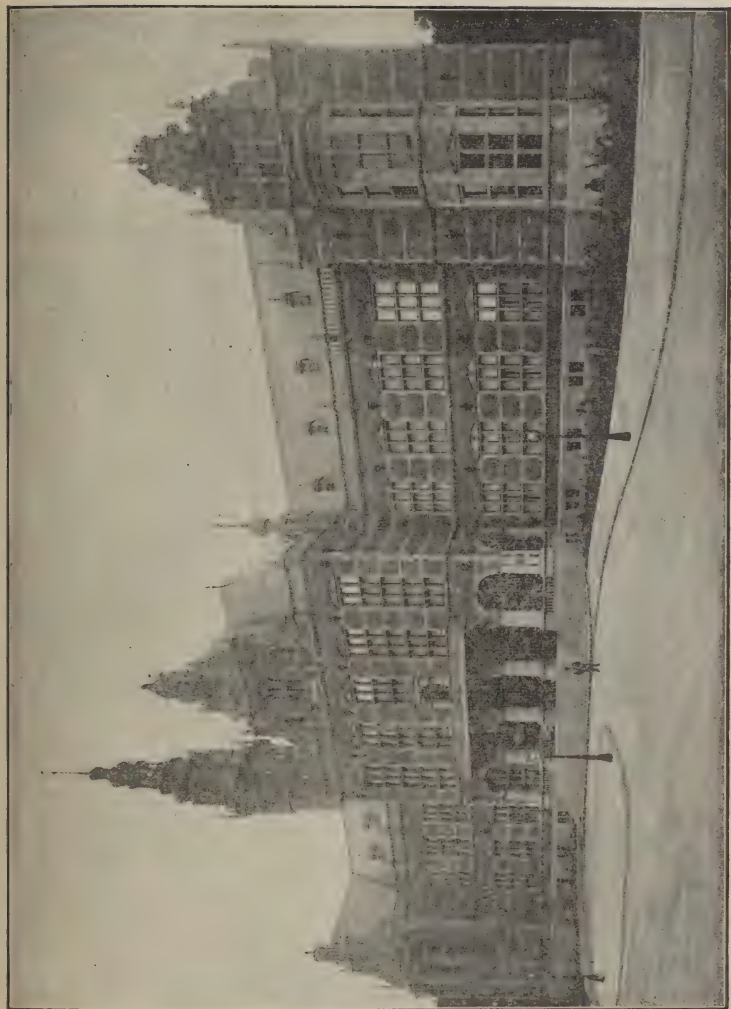
In 1568 The Netherlands rose against Spanish rule and began the fierce struggle for political and religious rights and liberties against the most powerful kingdom of Europe, a struggle which, soon confined to the Northern Netherlands, only after eighty years led to the recognition of the Republic of the United Netherlands. In the beginning the rebellion had but little success: the leaders, as far as they had not been able to escape, died on the scaffold or in prison; the apostate cities were one after the other reduced under the King's authority; armies, advancing for the relief of some town, were scattered or discharged for want of money. But in 1572 things took another turn; the "Beggars" captured Brielle (1st of April, 1572); the Prince of Orange, WILLIAM THE SILENT, the great leader of the rebellion, first compelled to flee to Germany, returned to The Netherlands; Alkmaar (in North Holland) defended itself so bravely, that the Spaniards had to raise the siege (1573), and Leyden, which had been besieged for months and was almost starved, was relieved, after the Prince had had the dikes pierced. The sea flowed into the country, inundated all the country around Leyden and forced the enemy to raise the siege (3rd of October, 1574).

According to tradition the university was established at

Leyden as reward for her heroic conduct. In this form the legend is certainly inaccurate; there is a connection between the two events, but not one of cause and effect. After the universities of the Southern Netherlands were closed to the Protestants of the North, the want made itself felt of an institution for the education of the necessary civil servants and clergymen, and a Protestant university and training-college for theologians especially would become a "strong bulwark", as the Prince calls it, in the struggle for freedom of faith. For, though it was not openly said at the erection of Leyden University, the Prince as well as his private councillors afterwards admitted more than once that the principal aim in founding this university was: theology. A short time after the relief of Leyden, in 1575, peace negotiations were opened but led to no result. If after the conclusion of peace a university was to be acknowledged eventually, it was essential that it should exist before those negotiations commenced or at least before they were at all in an advanced state. Hence its hurried erection, in a time when the general condition of the country and especially the financial situation, were by no means such as to attempt an enterprise of this description with any chance of success. That it nevertheless succeeded, and the university attained such prosperity in so short a time in spite of all difficulties, is especially due to the Prince and his eminent supporter, the hero of the siege, JANUS DOUSA. Their firm confidence in the righteousness of their cause enabled them to consider no difficulty and no sacrifice too great to achieve their purpose.

The charter (of 6th Jan. 1575) by which the King — for the document was issued in the name of the King by the Prince of Orange, as Stadtholder of the King in Holland and Zealand — commanded the establishment of a university at Leyden, forbade the erection of any other university in those two provinces. But this did not apply to the other provinces in the Northern Netherlands, and successively we see arise a university in each of them: in 1585 at Franeker for Friesland; 1614 at Groningen for the province of that name; 1636 at Utrecht for the province of Utrecht; 1648 at Harderwijk for Gelderland; whilst Overijssel had an





State University at Groningen.

Athenaeum in Deventer, like the one Amsterdam erected in 1631, but without *jus promovendi*.

As *civitates in civitate* the universities had an independent existence with great privileges, exemption from taxes and the right to administer justice.

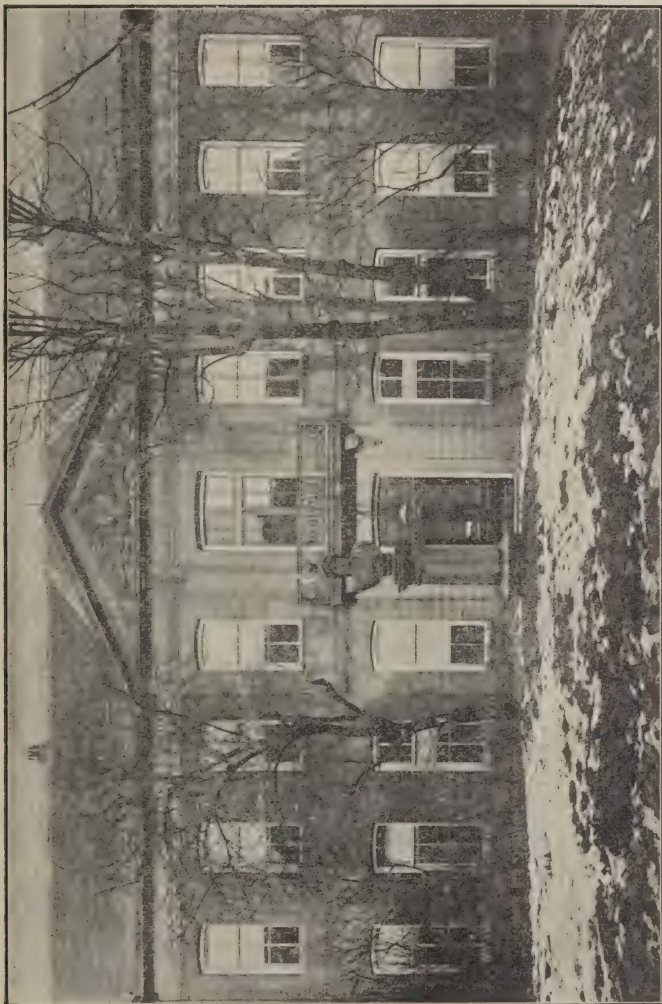
The revolution in the end of the eighteenth century terminated those privileges; when the kingdom of the Netherlands was annexed by the French Empire (1810) only the University of Leyden was left, as part of the *Université Impériale* at Paris; Franeker and Harderwijk were abolished; and the others were reduced to "*écoles secondaires*". But after the restoration in 1813 they revived once more and the so-called Organic Statute of 1815 incorporated the Universities of Leyden, Groningen, Utrecht, Harderwijk and Franeker. The two last-mentioned however died a natural death in the course of the nineteenth century.

University education in this country is regulated by Act of 28th April, 1876, subsequently amended by that of 22nd May, 1905.

The principal modifications made by the 1905 Act were the promotion of the Polytechnic School at Delft to a university (rendering possible graduation in engineering), the extension of *effectus civilis* to degrees conferred by private universities, and the institution of extraordinary professorates. At present we have in The Netherlands only one private university, the "Free University" at Amsterdam, on a Calvinistic basis. Up to now it has four faculties, for Theology, Law, Medicine and Philology.

The three State Universities at Leyden, Utrecht and Groningen and the Municipal University at Amsterdam have equal rights since the Act of 1876 and are organised and governed in the same way, though at Amsterdam there are some deviating rules in a few details, concerning salaries of professors and college fees, and here the appointments are not made by the Queen or the Minister of the Interior, but by the Municipality. These differences we may pass over here, and in speaking of universities we have the four mentioned above in view.

The University is governed by a body of five Curators.



Municipal University at Amsterdam.



Free University
at
Amsterdam.

They are the intermediaries between Government and University; the annual budget for the whole passes through their hands; and they submit names for the appointment of professors to the Queen, of other officials to the Minister of the Interior and see that the law is complied with.

The instruction is given by: (*a*) Ordinary Professors; (*b*) Extraordinary Professors; (*c*) Lecturers; and (*d*) Private Tutors. The three first-mentioned categories are appointed by the Queen, to whom their names are submitted by the Curators, who are again advised by the faculty concerned. Ordinary Professors begin on a salary of \$ 1,600, which after 5 years is raised to \$ 2,000 and again after 5 years to \$ 2,400. They are not allowed to hold another post without royal permission, but may exercise consultative practice; Medical Professors consider this to apply also to the performing of operations. Ordinary Professors retire at the age of seventy. The salaries of Extraordinary Professors and Lecturers vary according to circumstances. Why a Lecturer is appointed in one case and an Extraordinary Professor in another, is not always clear. Private Tutors are unpaid. They must obtain permission from the Minister of the Interior to teach some branch of science. As distinguished from the three preceding categories who need no qualifications, these Private Tutors must have the degree of doctor.

The Ordinary Professors together form the Senate of the University. One of them is appointed by the Queen "Rector Magnificus" for the period of one year. At the three State Universities this appointment goes by seniority, and each professor is Secretary of the Senate during the year preceding his term of office.

The academic year begins on the third Monday of the month of September. The retiring Rector Magnificus then delivers an oration in which he discusses the fate of the University during the past year. The breaking up (officially on the second Saturday in July) is not accompanied by any ceremony. The usual way of closing in the United States of America, viz. "Commencement", is unknown in the Netherlands Universities. The midsummer holidays are shorter

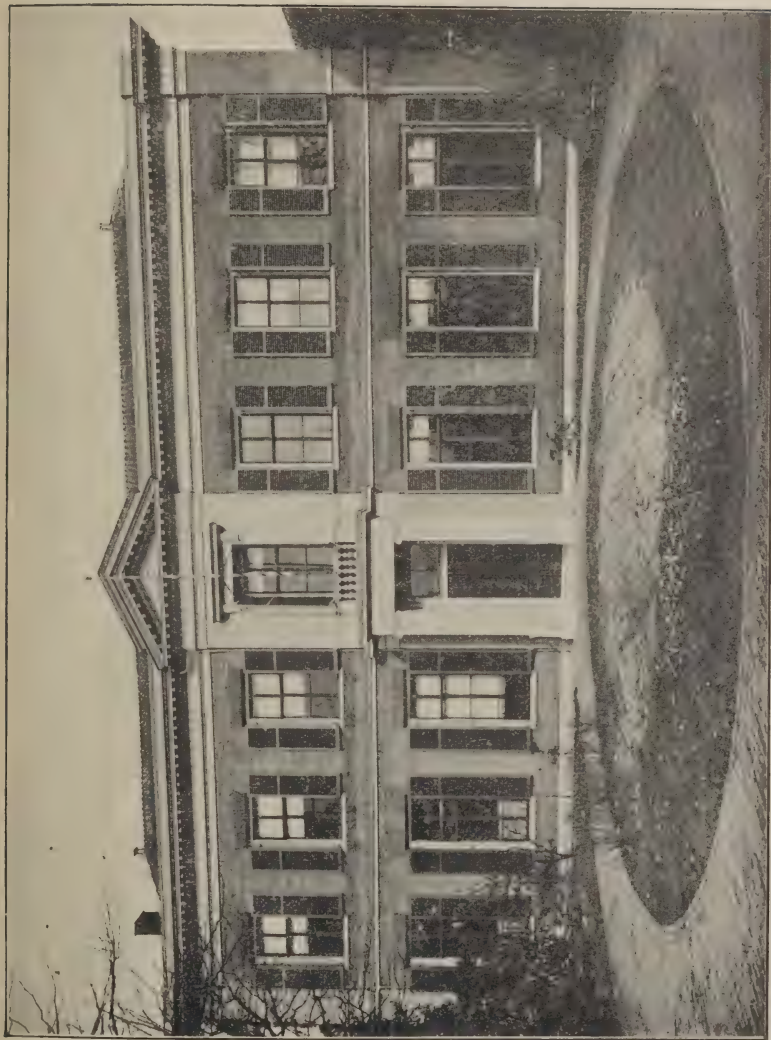
than those at the Universities, colleges and seminaries in the United States.

A committee of 4 Professors, called "Assessors", assist the Rector in the government of the University. They are generally selected from the retired Rectors, one for each faculty. The Rector has to maintain discipline among the students. In case of serious difficulties the Senate officiates as Court of Justice, with power of expulsion from the University.

The Netherlands Universities have 5 Faculties: of Theology, Law, Medicine, Mathematics and Natural Science, (here henceforth called the Faculty of Natural Philosophy) and Literature and Philosophy (Faculty of Arts).

Everyone enrolled by the Rector, is allowed to attend all lectures in all Faculties, upon payment of \$ 80 (per academical year). At the State Universities this college fee need not be paid more than 4 times; at Amsterdam they pay half the amount after the fourth year. Students of Divinity pay \$ 40 4 times at the State Universities. Curators may allow anyone to attend no more than two courses of lectures on payment of \$ 12.

In order to sit for an examination (for which the fee is \$ 20) one must hold the certificate for having passed the final examination of a "Gymnasium" (Grammar school). Our Gymnasias have a 6 years' course; at these schools instruction is given in: Latin, Greek, Netherlands, French, German, English, History, Geography, Mathematics, Physics, Analytic Chemistry, Natural History and Hebrew (this last only for future Divinity students and in the two highest classes). After passing through the fourth class the pupils are divided into: (a) future students of Law, Divinity and Arts; (b) future students of Medicine and of Natural Science. The former receive more lessons in Latin and Greek, the latter in Mathematics and Science. Foreigners are admitted to the academical examinations, if they are in possession of one of the certificates mentioned by royal decree for having passed an examination. This final examination of a "Gymnasium" corresponds with the degree of "Bachelor of Arts", conferred by the following universities in the United States:



Library of the Leyden State University

The Univ. of California, Berkeley (Ca.); Catholic Univ. of America, Washington (D.C.); The Univ. of Chicago, Chicago (Ill.); Clark Univ., Worcester (Mass.); Columbia Univ., New York City (N.Y.); Cornell Univ., Ithaca (N.Y.); Harvard Univ., Cambridge (Mass.); The Johns Hopkins Univ., Baltimore (Ma.); The Leland Stanford jun. Univ., Palo Alto (Ca.); University of Michigan, Ann Arbor (Mich.); Univ. of Pennsylvania, Philadelphia (Penns.); Princeton Univ., Princeton (N.J.); Univ. of Wisconsin, Madison (Wisc.); and Yale Univ., New Haven (Conn.).

To a certain extent the American "College" might be called a combination of our Gymnasium and our High School. As a rule the student can here follow three courses of study: (1). The classical course, entitling him to the degree of "Bachelor of Arts"; (2). the Latin-scientific course, entitling him to the degree of "Bachelor of Literature"; and (3). the course in the practical subjects of Natural Philosophy, entitling him to the degree of "Bachelor of Sciences". He then goes either into business or a profession, or, as for instance future clergymen, to a Seminary; or he enters a university to qualify himself further for his profession.

In the five Faculties mentioned above there are the following doctorates:

In the Faculty of Theology, that in Divinity;

In the Faculty of Law, those in Civil Law, in Political Science, and in Modern Roman-Netherlands Law;

In the Medical Faculty, the doctorates in Medicine, in Surgery and in Obstetrics;

In the Faculty of Natural Philosophy, those in Mathematics and Astronomy, in Mathematics and Physics, in Analytic Chemistry, in Geology and Mineralogy, in Botany and Zoology and in Pharmaceutics;

In the Literary Faculty: in Classical Literature, in Semitic Literature, in Netherlands Literature, in the Languages and Literature of the East Indian Archipelago and in Philosophy.

There is at present no separate doctorate in History, which subject forms part of the study for the doctorate in Netherlands Literature.

In order to take his degree the student has to pass two examinations: the Intermediate and the Final examination.

Besides these, theological and medical students must pass a preliminary (propaedeutic) examination, the former in Hebrew and Israelitic Antiquities, the latter in Physics, Analytic Chemistry, Botany and Zoology.

The Intermediate ("Candidaats") examination is a viva voce one, and according to the Faculty lasts from 1 to 3 $\frac{1}{2}$ hours; in the Theological Faculty, however, the examination is divided into two parts, with a maximum interval of one year.

The Final ("Doctoraal") examination, consisting of two parts, which take place within a short time of each other, is also a viva voce one, but between the two parts some subject is given to the candidates to be treated in writing, except to those in the Faculty of Law; this essay is discussed in the second part of the examination. After passing these examinations the future graduate writes a dissertation on a subject chosen by himself after consultation with one of the Professors, the "promotor", to which at least 12 Theses must be added. In the Faculty of Law it is sufficient to write 24 Theses, and for doctors who desire an additional doctorate in their own Faculty that number is likewise sufficient, of course after having passed the examinations required for the new doctorate. When Dissertation and Theses have been approved by the promotor, they are printed and sent to the Professors and to all those whom the candidate wishes to have them. After this the defence takes place, either in private, i. e. in the presence of the Faculty, or in public, i. e. in the presence of the Senate: criticism is permitted to those who have obtained the Rector's permission. Then the "defendens" is graduated. The graduation takes place without much ceremony. Public graduations are an exception at the Government Universities; whereas they are the rule at Amsterdam. Formerly there was also the graduation "more majorum" or "in cap", but on account of the great expense this has entirely gone out of practice.

Dissertation and Theses are written in Netherlands, except for the degree in Classical Literature, in which case



Royal Academy of Science ("Trippenhuys")
at
Amsterdam.

they are in Latin. Another language may be chosen however, by permission of the Faculty.

All students do not conclude their studies with a degree, as this is not always necessary for a profession. For law students who choose a legal career or want to be admitted to the Bar, the title of Doctor of Law is required. In the same way only one who has his degree in Classical Literature can be appointed as Rector or Sub-Rector of a Gymnasium. On the other hand, the Intermediate examination in the Literary and Philosophical Faculties gives the same qualifications for teaching as the degree of Doctor, and the Final examination in Civil Law and Political Science also gives the right to teach in High Schools.

In order to practise in medicine, those who have passed the final examination or have obtained their degree, must pass two practical medical examinations before a Government commission, usually consisting of Professors. In reality therefore this examination corresponds to a University examination before the Professors of the Medical Faculty, although the members of the commission need not necessarily be Professors.

Those who, instead of a Gymnasium, have attended a High School (where no classical languages are taught) with a five years' course, may also be qualified to exercise medical practice. They have to pass similar examinations (though bearing different names) to those who come from a Gymnasium, but they cannot take a degree. As in a High School more Mathematics, Physics and Chemistry are taught than in a Gymnasium, those who intend to study medicine often go to such a school and pass a supplementary examination in Latin and Greek, in order to be able to get a degree.

In contrast to the custom in the United States, an honorary degree is very seldom conferred.

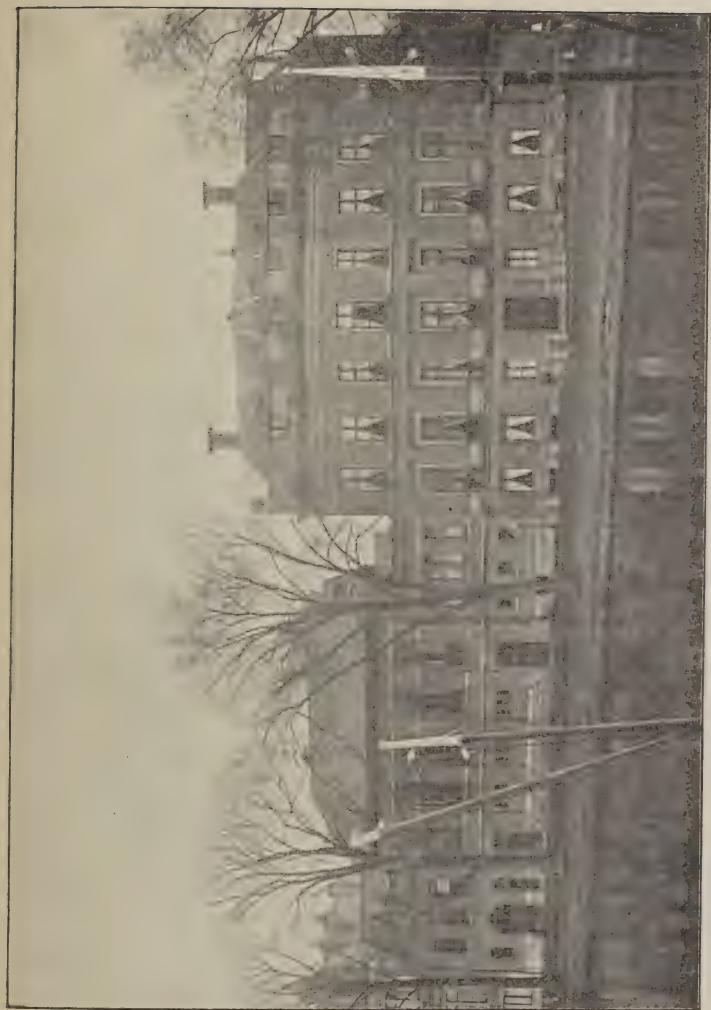
Many theological students conclude their studies with the Intermediate examination and then prepare for the examinations of the Church they have chosen. The Netherlands Reformed Church, the largest denomination in the country, has two Professors in each of the three Government Universities, who are appointed by the Church, but paid by

the State. The smaller denominations, the Mennonites and Lutherans, have a Seminary of their own at Amsterdam, and the Remonstrants have one at Leyden, where the future clergymen are prepared for the Church. After their Intermediate examination at the University they first pass an ecclesiastical preparatory examination before their (clerical) professors, and after that a "proponents" (candidate for the pulpit) examination before a clerical commission.

Here we may again notice some difference compared with the American training. In the United States prospective clergymen, to whatever Church they may belong, are all prepared for their profession in "Seminaries". The Netherlands Reformed Church in the United States has two such Seminaries: one at New Brunswick (N. J.) in the East, and another, "The Western Theological Seminary", at Holland (Mich.) in the Western part of the country.

The best-known of such institutions connected with the Presbyterian Church are: Princeton Seminary and the Mc. Cornick Seminary. The regular course of study generally lasts three years, during or after which an extra-curriculum course, leading to the degree of "Master of Arts" or "Bachelor of Divinity", can be followed. In order to be admitted as a clergyman in a Congregation the candidate has to sit for an examination before a clerical Commission.

The Netherlands student never attends more than one university; the German system of more than one is entirely unknown, which has the great drawback that the study often degenerates into a reading for the examinations. The coaching system is closely connected with this. This system means that before a student goes up for an examination he receives a number of private lessons from an older student or one who has his degree in that branch of learning, in order to prepare him for the particular questions that are likely to be asked at the examination. In the Faculty of Law it is almost an exception for an undergraduate to sit for an examination without having been coached. It stands to reason that this is not conducive to independent study. There are no seminaries on a German basis in The Netherlands. The students who are reading for their Intermediate



Building of the Holland Science Society at Haarlem.

examination all attend the same lectures together; and so do those going up for their final.

In smaller Faculties some Professors hold a "privatissimum" for a few students in a part of their branch of study that is not required for the examinations, or they make the advanced students write treatises on certain subjects, which essays are afterwards discussed with them. Besides lectures, the medical and natural philosophy students attend practical classes. We may say that on the whole our laboratories are very well appointed, though for a small country it always remains difficult to maintain four universities in full equipment for their teaching.

It has therefore been more than once urged that we should abolish at least one of the universities. But provincialism, that in the seventeenth century thought it necessary for each province to have a university, still flourishes, and a number of universities with incomplete equipment is preferred to one or two fully equipped in every respect.

Beyond "hospitia" for divinity students, which were abolished in the end of the eighteenth century, the Netherlands universities have never had "colleges". The students do not live in the buildings belonging to the University itself, as is the custom in America, but in rooms in the town. A board bearing the words "Cubicula locanda" is hung up outside the house where such rooms are to be let.

In this way living becomes more expensive than it is in America. The students also have more liberty with regard to their studies; they are free to attend the lectures or not, as they please, and they may go up for the examinations when they think they are ready. Although as a rule the students are on friendly terms with their professors, they are much less intimate with them than is the case in America.

Every university has its "corporation" (or "union") to which about 25 years ago all students belonged; but economic circumstances, real or pretended fear of the so-called "greening" (a 3 weeks' novitiate, during which time the young undergraduates are initiated into their new life by their elder colleagues in a manner not always exactly pedagogic, but which wrongly frightens many soft-hearted



Teyler's Museum at Haarlem.

mothers) have reduced the number of those that join this corporation to half the total number of undergraduates. They can be members of athletic and debating clubs and of numerous other societies intended to promote intercourse amongst the students, especially the clubhouse, with its large conversation, dining and billiard-rooms.

Formerly this corporation officially represented the students, but a gradual return to the state of things that gave rise to it, that of representation of each Faculty separately, may now be observed.

In September, 1914, the number of Ordinary and Extraordinary Professors, Lecturers and Private Tutors, divided according to the Faculties, was as follows:

	Ord. Prof.	Extra- ord. Prof.	Lec- turers.	Private Tutors.
LEYDEN.				
Fac. of Theology	8	—	—	—
Fac. of Law	11	—	1	2
Fac. of Medicine	10	3	3	6
Fac. of Nat. Philosophy	12	2	3	6
Fac. of Literature	17	4	7	5
UTRECHT.				
Fac. of Theology	7	—	—	1
Fac. of Law	7	1	—	—
Fac. of Medicine	11	—	7	4
Fac. of Nat. Philosophy	13	4	3	5
Fac. of Literature	10	5	1	6
GRONINGEN.				
Fac. of Theology	6	—	—	—
Fac. of Law	6	—	—	1
Fac. of Medicine	9	2	1	5
Fac. of Nat. Philosophy	10	—	1	3
Fac. of Literature	10	—	3	3

	Ord. Prof.	Extra ord. Prof.	Lec- turers.	Private Tutors.
AMSTERDAM (Mun. Univ.).				
Fac. of Theology	7	—	1	—
Fac. of Law	7	1	—	2
Fac. of Medicine	11	4	1	19
Fac. of Nat. Philosophy	11	7	1	5
Fac. of Literature	12	1	2	5
AMSTERDAM (Free Univ.).				
Fac. of Theology	5	1	—	—
Fac. of Law	3	—	—	—
Fac. of Medicine	1	—	1	—
Fac. of Literature	3	1	—	—

The number of students during the 1912—1913 course was :

1,211 (169 of whom were women and 240 enrolled for the first time)
at Leyden

1,099 (261 of whom were women and 221 enrolled for the first time)
at Utrecht.

585 (— of whom were women and — enrolled for the first time)
at Groningen.

1,225 (226 of whom were women and 212 enrolled for the first time)
at Amsterdam (Municipal Univ.).

172 (— of whom were women and 32 enrolled for the first time)
at Amsterdam (Free Univ.).

Divided according to the Faculties :

	Theol.	Law.	Med.	Math. and Nat. Sc.	Lit.
Leyden	80	479	357	161	134
Utrecht	121	116	543	173	146
Groningen	34	66	227	69	189
Amsterdam (Mun. Un.).	26	185	621	188	205
Amsterdam (Free Un.).	89	53	7	—	21

Every University possesses the laboratories, botanical gardens and museums required by the instruction there imparted. Amongst the latter must be particularly mentioned the Archæological, the Zoological and the Ethnographical Museum at Leyden. Amsterdam has the well-known zoological garden called "Natura Artis Magistra", though this is not a university institution. The Leyden Observatory, the oldest in Europe, is famous. Of the University libraries, by far the most important is the Leyden one, with its splendid collections of Oriental and Classical manuscripts.

Amongst the great Netherlands libraries there is further the Royal Library at The Hague, which principally collects books in the field of letters, history, legal and political sciences and art, with its branch, the MEERMANNOWESTRHEENIANUM Museum; and at the same place the Library of the Peace Palace, the gift of CARNEGIE, which solely collects in the realm of International Law and related subjects. Moreover, all the larger towns have their library, half scientific, half popular, with special collections relating to local history; we may mention here those of Leeuwarden — where also is found the BUMA library for classical literature — Haarlem, Deventer, Middelburg, etc.

The General State Archives are at The Hague, the provincial State Archives in the respective provincial capitals, and municipal archives in the principal towns.

Many learned societies arose here in the eighteenth century which devoted themselves to sub-sections of the sciences and of which one or two are still in existence, such as the Holland Scientific Society (Hollandsche Maatschappij der Wetenschappen) and TEYLER'S Society (Science and Theology), with fine art collections and a museum of physical sciences, both at Haarlem; the Bataafsche Society for Experimental Philosophy at Rotterdam (Sciences), and the Society of Netherlands Literature at Leyden. The Royal Academy of Science of Amsterdam was established in the middle of the nineteenth century, with two sections, one for mathematical and physical sciences and one for philology, literature, history and philosophy. All these societies have their members spread throughout the country, and also appoint foreign



Building of the Archæological Association (the Mint-tower) at Amsterdam.

members. There are also provincial and local societies which devote themselves principally to provincial history and philology and issue publications in their own sphere.

Special branches of science are studied by the Netherlands Archæological Association, of Amsterdam, the Historical Society of Utrecht, the Society for the Publication of Old Legal Documents (*Vereeniging tot uitgave van Oude Rechtsbronnen*), etc.

After this general review of Higher Education in this country, we leave the subject in the hands of a number of collaborators, who will describe more in detail the education given in the different faculties.

THEOLOGICAL INSTRUCTION IN THE NETHERLANDS

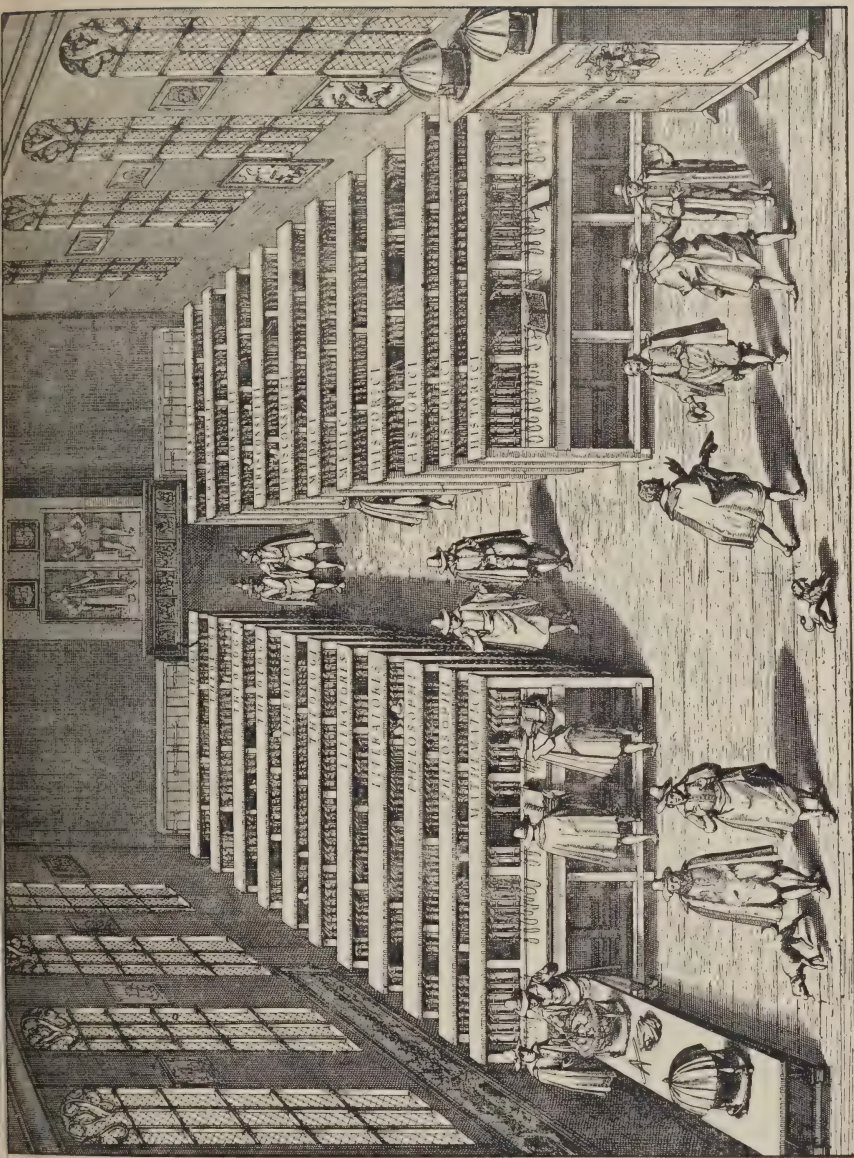
BY L. KNAPPERT.

THEOLOGICAL instruction in the Netherlands has always included the study of the "three Languages", and the students examined by the Reformed Church have been required to possess testimonials for having attended lectures in those languages. There is no need to repeat what the reader can find elsewhere about the study of Latin and Greek in this country; we will only mention what is closely connected with theological science, Hebrew and Oriental languages in general. As a rule the teaching of Semitic languages at the Netherlands universities has been closely connected with that of theology. The theological faculties needed teachers of the *litterae sacrae*, and so the professors of Hebrew and Hebrew Antiquities generally belonged to that faculty. The Leyden university forms the only exception to this rule: a chair for "Oriental" languages has existed here almost without interruption since its foundation; in consequence its theologians studied linguistics less than elsewhere. The need of instruction in Hebrew, the outcome of the instruction in theology, had a favourable influence on the study of this tongue and cognate languages. Without the existence of the theological faculty, the large Netherlands school of Orientalists would certainly never have attained its acknowledged development. On the other hand the study of the East was of great importance for Netherlands theology: it counteracted the arbitrariness of the dogmatists and the rigidity of the traditional criticism by its knowledge of the Semitic world, and thus became the precursor of modern exegesis *e mente auctoris*. We may here mention the names of COCCEJUS at Franeker (1636—1650) and at Leyden (1650—1669) and JAC. ALTING at Groningen (1643—1679).

Another branch of learning also owes a great deal to

our Oriental school, the history of religions. The history of religions in general (taught in the theological faculties since 1876) owes a great deal to Assyriology and Egyptology. Professor C. P. TIELE (1830—1902), the first teacher of these branches at the Leyden University, entered upon his office on the 10th of October, 1877, with an oration on: “De vrucht der Assyriologie voor de vergelijkende geschiedenis der godsdiensten” *). The study of Israel’s language and antiquities led to that of the later Judaism [in the 17th century C. l’EMPEREUR at Harderwyk (1619—1627) and at Leyden (1627—1647); in the 18th W. SURENHUSIUS at Amsterdam (1704—1729)]. At the same time the study of Arabic led to the knowledge of Islam. TH. ERPENIUS at Leyden (1613—1624) and JAC. GOLIUS, also at Leyden (1625—1668), had facilitated the approach to Arabic, the former by his grammar, the latter by his dictionary. Through his “De religione mohammedica” the eminent ADR. RELAND at Utrecht (1701—1718) became the precursor of the newer Netherlands islamists, R. DOZY, TH. HOUTSMA, C. SNOUCK HURGRONJE, and TH. W. JULJNBOLL. From LEVINUS WARNER († 1668) the Leyden University received a bequest of Oriental manuscripts (legatum Warnerianum). Not only the science of theology, but also comparative philology was studied by our orientalists as far back as the 18th century. The Groningen professor N. G. SCHROEDER (1748—1798) wrote a work in which the Hebrew roots were compared with those of other Semitic dialects. The family of SCHULTENS—ALBERTUS at Franeker (1713—1729) and at Leyden (1729—1749), JOH. JACOBUS at Leyden (1749—1778), and HENR. ALBERTUS at Amsterdam (1774—1779) and at Leyden (1779—1793) especially profited by comparative philology with regard to the Hebrew lexicon. Hebrew studied with famous results by such a man as SIXTINUS AMAMA at Franeker, in the beginning of the 17th century, enjoyed such one-sided preference among many theologians that C. SCHOTANUS at Franeker urged a more profound study of Greek as a counterpoise (“Manuale Novi Testamenti” after PASOR, 1664).

*) “The Effect of Assyriology on the Study of the Comparative History of Religions.”



Library of Leyden University, 17th century.

Two translations of the Old Testament from Hebrew into Netherlands appeared in the 17th and 19th centuries respectively: the authorized translation or "Staten-vertaling" (for the Old Testament BOGERMAN, BAUDARTIUS, BUCER, etc.) 1626—1637, and the Leyden translation (HOOPYKAAS, KOSTERS, KUENEN and OORT 1885—1901).

The first to study the languages of the Netherlands East Indies were the semitic scholars TACO ROORDA at Amsterdam (1828—1841) and P. J. VETH at Franeker (1841—1843), at Amsterdam (1843—1864), and at Leyden (1864—1884).

Among theological subjects the interpretation of the Bible took a foremost place. Numerous scholars made their mark by their studies of the Books of the Old and New Testaments in the original tongue. CALVIN himself drew attention to the possibility of an historical-grammatical interpretation of the Scriptures, but a large majority of the hermeneutists were tied by their dogmatism and by the exegetic method applied to the New Testament, which required an allegorical and typological criticism in many places of the Old Testament. The 19th century brought for the first time a different conception of the authority of the Bible and of the relation between Old and New Testaments; and exegesis could move more freely when belief in the literal inspiration of the Scriptures gave way to a more spiritual and historical appreciation. HUGO GROTIUS (1583—1645) ("Opera omnia theologica", Amsterdam, 1679), worked hard for the true understanding of the Scriptures. He opposed the above-mentioned notion, that the exegetical methods applied to the New should be blindly followed for the interpretation of the Old Testament. COCCÆJUS, whom we have already mentioned, opened new ways for exegesis, when he asserted that undoubtedly the true meaning of a word or sentence can only be ascertained by inquiring into the spirit and intention of the author, in accordance with the analogy of the Scriptures, and after mature consideration of what is added, precedes

and follows ("Praef. Comm. ad Rom.", "Oratio de philologia sacra"). Yet his criticism too is influenced by his federal theology. CAMPEGIUS VITRINGA of Franeker (1680—1722) restored and maintained the historical import of the Scriptures with great accuracy, although even he could not entirely free himself from Cocceian typology ("De Synagoga vetere", 1696; *Observationum sacrarum libri VII*, 1700—1727). At Leyden HERMAN WITSIUS († 1708) and JOH. à MARCK († 1731) had come to the fore. JOH. JAC. WETTSTEIN of Amsterdam († 1754) gave in his *Novum Testamentum*, after the *textus receptus* with the *variae lectiones* and commentary, the result of a whole life's study devoted to the criticism of the New Testament. The 19th century brought the triumph of the historical-critical method, applied to the Old Testament by ABRAHAM KUENEN ("Historisch-kritisch onderzoek naar het ontstaan en de verzameling van de boeken des Ouden Verbonds", 1861—1865. 2^o. ed. 1885—1889), and to the New Testament by SCHOLTEN and his school, from which in its turn arose the radical school of W. C. VAN MANEN and A. D. LOMAN. At Utrecht J. I. DOEDES and afterwards J. M. F. BALJON walked in more conservative ways.

In the field of the history of Israelitish literature BENEDICTUS SPINOZA (1632—1677) undertook an investigation of its origin in his "Tractatus theologico-politicus" (1670); his wish was only to avail himself of the "natural light of reason that is also of God", and he says amongst other things that the word of God to the prophets reveals the divine will that they should obey God with a pure mind by practising justice. SPINOZA also clearly foresaw the more modern treatment of the Pentateuch. His views found no adherence. KUENEN was the first to give an undogmatic history of the literature of the Old Testament, in which he followed originally the order of the canon and placed the Law before the Prophets. Afterwards he changed this point of view ("De Godsdienst van Israël", 1869/1870. H. K. O.²), partly under the influence of K. H. GRAF, and placed the Prophets before the Law. Some modern critics incline to a view which is more in accordance with KUENEN's first standpoint.

Many scholars applied themselves to Ancient Christian

literature, their work being more and more influenced by the increasing knowledge of the East.

The history of Christianity, commonly called Church History, was at first not studied as an independent subject in the Universities of the Northern Netherlands. Early historians treated it together with political history (BOR, VAN METEREN, and HOOFT). The "*Systema theologicum*" by the Franeker professor HENR. NERDENUS (1611) is of importance, not for its dogmatic contents, but because of the contributions it contains to the history of the introduction of the Reformation in this country. The same may be said of the book of MART. SCHOOCK of Groningen: "*Liber de bonis vulgo ecclesiasticis dictis*" (1651), a polemical work about the ecclesiastical property and canons of Utrecht, which has now great value on account of *Sectio tertia caput septimum*, that forms a rich source for the history of the Reformation. The Arminian controversy gave rise to JAC. TRIGLAND's "*Kerkelijke geschiedenissen*" (*Ecclesiastical Histories*) of 1650, highly important for our knowledge of the period, though the historian is too often overborne by the dogmatist, and to JOH. WTTENBOGAERT's "*De Kerkelijke Historie*", 1646, considered from the Remonstrant point of view. Better than either of these is GEERARD BRANDT's "*Historie der Reformatie*", 4 vol., 1671—1702 (the two last volumes are posthumous), which deals with events as late as 1623, an entirely new and original work, the true value of which was not appreciated until the present day. The 18th century may boast of DANIEL GERDES at Groningen (1698—1765). He advocates impartiality and love of truth in the historian (*Praefatio* to "*Introductio in historiam evangelii seculo XVI passim per Europam renovati*", 1744—1752, 4 vol.), which principles he also follows in his "*Scrinium antiquarium*", 1748—1765, 8 vol., a storehouse of most important documents. His "*Specimen Italiae reformatae*", 1765, was published posthumously. At Franeker there flourished HERMAN VENEMA (1697—1787), whose "*Institutiones historiae ecclesiasticae V. ac N. T.*" (7 vol. 1777—1783) is an excellent work on the complete

history of the Church (beginning with Adam!) up to the establishment of the Reformation in Europe, critically and impartially drawn from original sources: the first effort in pragmatic historical research.



Oratio inauguralis in the Great Auditorium of Leyden University
(18th century).

JONA WILLEM TE WATER (1740—1822) was succeeded
by HERM. JOH. ROOYAARDS (1794—1855) and NIC. CHR. KIST

(1793—1859) who at Utrecht and Leyden brought Church History to a high degree of development. The “Archief voor kerkelijke geschiedenis”, vol. I 1829 (Archives for Ecclesiastical History) stands before us as a monument of their labour. It still exists, one editor succeeding the other, and gives universal as well as national history of Christianity. But the real founder of the new school is WILLEM MOLL of Amsterdam (1812—1879), equally excellent in historical research and writing, and especially famous for what he did for the history of our mediaeval church (“Johannes Brugman” 1854; “Kerkgeschiedenis van Nederland vóór de Hervorming”, 2 tom. 6 vol. 1864—1871). He was followed by his best pupil, J. G. R. ACQUOY of Leyden (1829—1896). In the latter’s inaugural lecture at Leyden (7th of Dec. 1881) he argues that the subject should rather be called “History of Christianity” than “Church History”, this being more comprehensive and including movements outside the Church. His chief work is “Het klooster te Windesheim en zijn invloed” (3 vol. 1875—1880), while he explained his method in his “Handleiding tot de kerkgeschiedvorsching en kerkgeschiedschrijving”, 1894, 2nd ed. by F. PIJPER, 1910. The Amsterdam professor J. G. DE HOOP SCHEFFER (1819—1893) gave a “Geschiedenis der kerkhervorming in Nederland van haar ontstaan tot 1531” (History of the Reformation in The Netherlands from its Origin till 1531), 2 vol. 1873. At the same time he dealt in several articles with the history of his own denomination, that of the Mennonites, which work was continued by his successor S. CRAMER (1842—1913). Work of the same kind was performed for the history of the Remonstrants by JOAN TIDEMAN and the Amsterdam professor H. C. ROGGE (1831—1905) and by T. J. DOMELA NIEUWENHUIS and JOH. PONT for that of the Lutherans. A “History of the Netherlands Reformed Church” was given by YPEY and DERMOUT in 4 vol. (1819—1827) — the first of its kind, excellent in many respects, and valuable for the extensive material from original sources; B. GLASIUS (“Godgeleerd Nederland”) in 3 vol. 1842—1844; G. J. Vos, on orthodox lines (“Geschiedenis der Vaderlandsche kerk”) 1881—82; J. REITSMA, professor of the Reformed Church at Groningen (1837—1902) (“Gesch.

van de Hervorming en de Herv. kerk in Nederland") 1893, 2nd ed. 1899 (3rd ed., posthumous and revised, is being published) and finally by the writer of these pages ("Geschiedenis der Ned. Hervorinde Kerk") 2 vol. 1911, 1912. The "Bibliotheca Reformatoria neerlandica", by PYPER and CRAMER, 10 vol. 1903—1914, is a collection of documents from the days of the Reformation, newly edited with introductions and annotations. At the present moment the professors of history of Christianity as a rule also teach history of Christian dogmatics.

The encyclopaedia has been dealt with by VOETIUS in "Exercitia et Bibliotheca studiosi theologiae"; H. VAN DIEST: "De ratione studii theologici"; J. CLARISSE: "Encyclopaediae theologiae epitome", 1st ed. 1832; and A. KUYPER: "Encyclopaedie der H. Godgeleerdheid", 1894.

At the outset the early Netherlands Reformed Church had no binding Confessional articles; originally she was more biblical than dogmatical, consequently there was no strongly felt want of scientific dogmatics. In the series *lectionum* at Leyden of 1587 no mention is made of lectures on dogmatics, and the first manual of dogmatics used in this University, the "Synopsis methodi sacrae theologiae", was by Professor LUCAS TRELCATIUS the elder, who became professor there in 1587.

The growing influence of the Calvinistic element brought more sharply defined doctrine and the need of a scientific treatment of dogma. Moreover, when the Church had been established firmly externally, the old controversies came to the fore within her walls: God's Absolute Sovereignty and human freedom, election and Man's responsibility, in which doctrines the Calvinistic-Reformed theologians started from the theological point of view and the Remonstrant-Reformed theologians from the anthropological. The latter were condemned at the Synod of Dort, and the five canons (proclaimed on May 6th, 1619) form the first dogmatical document of the Reformed Church, supralapsarian, but here and there giving in to infralapsarianism, together with the Confession

or XXXVII Articles and the Heidelberg Catechism the Three Formularies of Unity. These formed the foundation for all subsequent dogmatic University education. This is obvious immediately from the famous "Synopsis purioris theologiae" by the Theological faculty of Leyden (restored after 1618): POLYANDER, RIVETUS, WALAEUS and THYSIUS, 1625 (3rd ed. 1642, 4th 1652, 5th 1658) which comprises the whole of dogmatics in 52 disputations and is a model for the treatment of ecclesiastical doctrine.

A place of honour has been taken by dogmatics in the universities ever since: there has been hardly any professor who has not devoted a course of lectures to it. We can only give an outline of the subject, however.

SIMON EPISCOPIUS taught in the Remonstrant Seminary at Amsterdam. He drew up the Confession for his Church, which gives an account of their creed, equally excellent in form and contents and with a sharp distinction between necessary and unnecessary doctrines. The same spirit speaks from his "Institutiones theologicae", where the ecclesiastical dogma retires behind scriptural doctrine, a kind of biblical dogmatics, not speculatively philosophical, but "pure practica", with a distinct reserve towards the mystery of God's decree. His successors DE COURCELLES, POELENBURGH, and à LIMBORCH worked in the same spirit.

At Utrecht there flourished at that time the great Calvinistic-Reformed dogmatist GISEBERTUS VOETIUS. He brought dogmatics to the level of science, as he understood it, which among other things implied that he drew into the pale of dogmatics even questions of a philosophical nature. The Dort system found in him its most powerful defender. This is testified by one of his principal works: "Disputationes theologicae selectae", 5 tom. 1648—1669, the greater part of which is devoted to theological-dogmatic controversies. His colleagues in the faculty followed in his footsteps, JOH. HOORNBEEK (from 1644), with a strong tendency towards polemics, especially in his "Summa controversiarum", 1650, and a preference for historical studies, and ANDREAS ESSENIUS in his "Compendium theologiae dogmaticae". In the course of time all those who fought for the received doctrine of the Church,

were called VOETIANS. In the second half of the century they found opposed to them the COCCEIANS, the followers of COCCEJUS in his dogmatical conception of federal theology, a "household of covenants". God had entered into a covenant of works with Adam, into a covenant of grace with Moses, and finally into a new covenant with Christ, as the head of a congregation to be gathered by Him, and in such a way that the Old Testament foreshadowed the gifts of salvation of the New Testament (doctrine of prototypes). BULLINGER had taught this Covenant theory previously in his "Huysboeck", but this was unknown to COCCEJUS. Although therefore the idea was not new, the whole system built on it appeared dangerous to the Doctrine of the Church (how different is the place of the Mediator in the "foedus Dei" from that in the "decretum Dei"!). Hence violent attacks were made upon COCCEJUS' "Summa doctrinae de foedere et testamento explicata", 1648, by HOORNBEEK, among others, for whom there was no difference between scriptural doctrine and dogmatics, divine and ecclesiastical authority. But even he did not yet appeal to the Three Formularies. The 18th century asserted their absolute authority for the first time. At Groningen it was JOH. BRAUN (from 1680) who in his "Doctrina foederum" deduces all theology, natural and revealed, from this one point, God's covenant with man. The 19th like the 17th century was fertile in regard to the development of dogmatics. After "Aufklärung" and Old-liberalism (a rationalistic supernaturalism) the Groningen school introduced a new period. The "compendium dogmatices et apologetices christianae" of HOFSTEDE DE GROOT and L. G. PAREAU is of 1840 (1845², 1848³) and teaches that the awakened life of faith is the starting-point of theology: faith goes before dogma. God reveals Himself to us in the development and training of the human race, and of that universal revelation the Christian revelation forms part, of which again Jesus Christ, the Divine Man, is the centre. In His Exaltation He governs his Community: a Christocracy. In hamartiology they teach that the good in Man did not die, in spite of the power of sin.

Opposed by the rigorously orthodox theologians, the

Groningen school in its turn rejected the rising "Modern" theology. C. W. OPZOOMER, appointed Professor at Utrecht in 1846, first taught, under the influence of KRAUSE, that what pious faith accepted has now been confirmed as truth by philosophy, "reconciling Man to himself". Later ("De weg der Wetenschap" — "The Road of Science" — 1851) empiricism, the passion for reality, became to him the source of knowledge — but only of material things. Faith, however, is based on the religious feeling that makes us conscious of God as immediate truth. Though he differed here from SCHOLTEN, he was like him determinist, teleologist and antisupranaturalist, and even approached him still more when he deduced by pure reasoning that the results of science will again and again confirm the experience of the religious feeling. J. H. SCHOLTEN at Leyden ("De leer der hervormde kerk" I 1848, II 1850, 1851², 1855³, 1862⁴; "Dogmaticae christianae initia", 1854; "De vrije wil", 1859) found the basis of faith in the testimonium spiritus sancti, in accordance with the testimony of reason, which can also rise to things divine. It brings certainty and makes us also acquainted with God through empirical investigation of nature, history and man. SCHOLTEN is monist, antisupranaturalist and teaches a rigorous determinism. The work of God in the world is evolutionistic and teleological. He is Absolute Sovereign and also holy, which is not irreconcilable with the existence of sin, this being only an "ens negativum" and destined to disappear at the end of time. S. HOEKSTRA, of Amsterdam ("Het geloof des harten volgens het Evangelie", 1857; "De ontwikkeling van de zedelijke idee in de geschiedenis", 1862; "Bronnen en grondslagen van het godsdienstig geloof", 1864) brings to the fore the anthropological and psychological element in dogmatics. His starting-point is the belief in the truth of our own inward being, that testifies to God. Religion is born of the need for deliverance from affliction and from sin, which according to HOEKSTRA is positive. Against SCHOLTEN's determinism, he maintains the individuality of man and a moderate indeterminism. Modern theology was opposed by DOEDES and VAN OOSTERZEE, who maintained biblical-supranaturalism, and by D. CHANTEPIE DE LA SAUSSAYE and J. H.

GUNNING, on first principles especially, who placed their ethical-irenic principle opposite to SCHOLTEN's intellectualism, ethical not meaning moral, but spiritual. The foundation of faith is not reason, but purified spiritual life, when Christ Himself lives in the reborn soul. Then only do we comprehend, because we understand with our heart. On this all theology is based, whose further task is to expound the faith of the Community scientifically. Among the Moderns themselves SCHOLTEN met with opposition. Some, radically-sceptical, dropped off to the radical side; the group of the ethical Moderns declared belief and knowledge to be heterogeneous, abjured "deterministic fatalism" and found the basis of theology in moral nature. As an outcome of the "Réveil" (BILDERDIJK, DA COSTA, and GROEN VAN PRINSTERER) the anti-revolutionary party arose in the field of politics, and in that of religion as Neo-Calvinism, whose dogmatists, Dr. ABR. KUYPER and Dr. H. BAVINCK, advocate the doctrine of CALVIN, in many ways revised ("Encyclopaedie der H. Godgeleerdheid", 1894; "Gereformeerde Dogmatiek").

Few only among the Netherlands theologians applied themselves to Ethics. In the 17th century it appears under English influence as casuistry in a pietistic and ascetic sense. Thus we find it in the book on the "Casus Conscientiae" (Cases of Conscience) (1623), by Professor AMESIUS at Franeker, the pupil of WILLIAM PERKINS. As late as the end of that century LEYDECKER gave lectures on this book at Utrecht. Others, such as RIVETUS at Leyden, contented themselves with deriving a system of Christian morals from the Decalogue; whereas others such as WALAEUS, also at Leyden, revised the ethics of ARISTOTLE, so as to make them apply to Christianity. In the beginning of the 18th century CAMPEGIUS VITRINGA at Franeker taught Ethics as "the morals and acts in the State of Christianity according to the doctrine of the gospel". As we see, it did not get beyond a practical treatment of evangelic morality, and those who applied themselves to it were always few in number — most probably owing to the fact that morality, the doctrine of virtue, laid one under suspicion of Arminianism.

JOH. CLARISSE, who was at Harderwyk from 1804 till

1815 and afterwards at Leyden, was the first to apply himself to the philosophical study of morality, while his colleague VAN VOORST still exclusively taught Christian morality. To PAREAU, one of the founders of the "Groningen school", morality was, in accordance with the principles of that school, the scientific development of the way in which God through Jesus Christ leads Man to virtue, holiness and love ("Initia institutionis chr. moralis", 1843). The empirical method was also introduced into Ethics with OPZOOMER and PIERSON, the necessity of anthropological investigation being likewise taught by them. KUENEN, the Leyden Old Testament scholar, also great as a moralist, following SCHLEIERMACHER, though deviating from him here and there, divided his subject-matter (according to the sketch by his pupil GROENEWEGEN) in this way: anthropological introduction; origin and development of moral life in man and in mankind; modern conception of moral life; the moral ideal; the doctrine of duty; the doctrine of virtue. The influence of HOEKSTRA at Amsterdam was also great. He maintained in opposition to SCHOLTEN a moderate indeterminism in ethics, and to him individuality, the Ego, is equal to the one who wills, I Will. Quite recently Professor P. D. CHANTEPIE DE LA SAUSSAYE of Leyden published a book on "Het Christelijk leven" (The Christian life) (2 vol. 1910, 1912).

Practical theology — homiletics, catechetics, liturgics, and poimenics — won its place in theological education also only gradually. At the Synod of Dort, 1618/1619, a gravamen of classis Zierikzee was put on the table, which strongly urged instruction in theologia practica. Yet in his "Ecclesiastes" Professor LUCAS TRELCATIUS the younger, of Leyden (1573 – 1607) had already given a homiletics, the first in this subject, of which we still have a printed edition. At Groningen JACOBUS ALTING († 1679), the teacher of the famous BALTHASAR BEKKER (who also published his opera omnia) raised an interest in practical theology, especially in religious instruction, which was then very poor. The manuals for students of that time, such as MARESIUS' "Enchiridion" (1645)

and VAN DIEST's "De ratione studii theologici" (1634), resp. of Groningen and Harderwyk, also advocated the importance of practice in preaching, etc., here and there with success, resulting if not in public lectures, yet in private exercise. We know no manual, properly speaking, of practical theology save HENR. RAVESTEIJN's "De Nazireeër Gods", 1740, which superseded the book of the Englishman BOWLES, "De pastore evangelico". The influence of the great COCCIJUS, first at Franeker, then at Leyden († 1669) on the instruction of homiletics is less deep than is usually asserted. It is true that he was a zealous defender of exegesis "e mente auctoris" and of biblical preaching, but these principles were practised but very imperfectly. The analytic method of preaching prevailed everywhere, with scholastic demonstrations and learned explanations. For the sermon was above all things interpretation of the Scriptures. The Leyden professor EWALD HOLLEBEEK († 1796) brought a real improvement by recommending to his pupils the so-called English method of preaching (that of TILLOTSON, DODDRIDGE, etc.), which is synthetical and attends to the religious wants of the audience. In this manner HOLLEBEEK became the pioneer for the great homilists of the beginning of the 19th century. During this period excellent books on the art of preaching were published, such as: CLARISSE's "Voorlezingen" (1814, 2nd ed. 1839), DES AMORIE VAN DER HOEVEN's "Joh. Chrysostomus" (1825), VAN HENGEL's "Institutio oratoris sacri" (1829), STEENMEIJER's "Brieven over de welsprekendheid" (1853); but much attention was paid also to instruction in the whole domain of practical theology. This is testified by the lectures of J. HERINGA E. fil. at Utrecht († 1840) and also by two excellent manuals, the "Practische godgeleerdheid", by MUURLING of Groningen (1851—1857) and the "Practische theologie" by VAN OOSTERZEE of Utrecht (2nd ed. 1895). Since 1876 the theologia practica has been removed from the list of lectures in the Universities by the State Professors; at present this branch of study, as well as theologia biblica, history of missions and dogmatics is taught in Protestant seminaries instituted by the various Churches.

The reader of this short and necessarily incomplete sketch who wishes to know more about the subject, should study the following works by C. SEPP: "Het godgeleerd onderwijs in Nederland gedurende de 16^{de} en 17^{de} eeuw", 2 vol. 1873, 1874; "Joh. Stinstra en zijn tijd, eene bijdrage tot de geschiedenis der kerk en school in de 18^{de} eeuw", 2 vol. 1865, 1866; "Proeve eener pragmatische geschiedenis der theologie in Nederland van 1787—1858", 1 vol. 3rd ed. 1869; and "Bibliotheek van Nederlandsche Kerkgeschiedschrijvers", 1 vol. 1886.

A. C. DUKER's "Gisbertus Voetius", 3 vol. 1897—1914, deals especially with the 17th century; whilst for the 19th century up to 1875 there are: K. H. ROESSINGH's "De moderne theologie in Nederland", 1914, and JAMES HUTTON MACKAY's "Religious Thought in Holland during the Nineteenth Century", London, 1911.

A REVIEW OF THE LAW OF THE NETHERLANDS

BY J. VAN KUYK.

UPON the whole the political life of a nation falls together with its judicial development. Thus the division of judicial life may be seen when it is brought in connection with the threefold division in: the time of the Middle Ages, the time of the Republic of the United Netherlands in the seventeenth and eighteenth centuries, and that of the Kingdom of the Netherlands in the nineteenth century. The duration of each of these periods is not distinctly defined, times of transition with struggles and confusion being naturally found between the close of the one and the opening of the other.

We must briefly sketch these three periods, each with its characteristic features and considered in relation to its significance to the whole, in order to give an idea of the law of the Netherlands, viz., the time of the early development and growth of the original Netherlands law; that of the intrusion of foreign, more particularly classical law, with its influence on this original law; and finally the period of the later Netherlands law, born under French auspices. We can easily see the development: Germanic law, influenced by Roman law and again transformed through French law — law, born together with the nation, influenced and transformed beyond recognition, grown to a mixture the origin of whose elements is often as mysterious as the whole is foreign to the sense of justice.

The first period is that of the common law, growing and developing along with the economic and political wants of the people and being applied in cases of justice where at first the whole nation, and later its representatives, officiates as the one who declares the law. This period is to be distinguished from the two others, in which people and law are

estranged from each other, where law grows to be a law of jurists, and jurisprudence the task of lawyers. This difference can only be partly explained as a natural consequence of its development while the population was changing its manner of life, and while social relations were becoming more complex and jurisprudence more intensive; but it was certainly for the greater part brought about by conscious action of the monarchs and their officials, proceeding from juridical circles, and by systematic extension of foreign law through science and legal practice.

The first period of which short mention should be made, is the one in which these countries, politically forming part of the Teutonic nations, possessed a law of their own, along the coasts and far into the country, of pure Frisian origin, in the South influenced by Frankish dominion, and in the East adapting itself in many respects to Saxon rule. Then there was a gradual development of the larger political unities under their lords (the Dukes of Brabant and Gelderland, the Counts of Holland and Zealand, and the Bishop of Utrecht); and within their territories a development of the manors and, especially since the thirteenth century, the towns. Together with this development, which placed public authority more and more in various hands, we find a division of justice over a great number of independent and distinctly separate jurisdictions, which in mutual rivalry anxiously tried to maintain their real or presumed independence; and they succeeded but all too well in this tendency because a strong central authority was wanting. For the centres of commerce and trade, accordingly for the towns, municipal law has grown out of the general national law. The towns having obtained, with the support and assistance of the overlord, a government and jurisdiction of their own, collect their laws in codes, not as a systematic whole, but as a collection of independently derived ordinances or "*Keuren*". The chief thing in the municipal law is the statute-law — the product of legislation — for the town has the power to make ordinances, and by means of this satisfies the desire for new forms of justice that makes itself felt at every moment. By

its side we must note the law of the rural districts, remarkable because of its being for a far greater part a law based on custom. The sources of that law are mostly records of the prevalent law, such as survived from one generation to the other in the ideas of the people. Each change was but the development and improvement of the old law. Since in the country the simple manner of life continued much longer, these people were much less in want of acts of legislation than in the towns, where they lived by trade and industry. As towns with a richly developed municipal law we may mention: Dordrecht, Leyden, Haarlem, Utrecht, Zutphen, Kampen and Groningen. Special mention should be made of the little town of Brielle, because its law gave rise to the composition of a monument of jurisprudence, unique in its attempt and execution. It is the "Rechtsboek van den Briel" (Brielle Book of Law), written by the town clerk of Brielle, JAN MATTHYSSEN, in the beginning of the fifteenth century. It gives a clear and concise account of jurisdiction and procedure in a mediaeval town.

Besides rural and municipal law as the general national law, maintained by public authority, we must point to the court, tribute and feudal law, special forms of law for certain relations of dependence, connected with the claims on the land, and supported by the organs of a private dominion. Those relations arose when great land-holders, that is to say, those who had authority in mediaeval-feudal society — nobility and clergy — distributed on a large scale the estates belonging to them among tenants, who were free to use them. Those tenants, it is true, remained freemen, but yet, through the usurpation of power by the great lords, they were in a sense dependent upon their influence, which in the course of time grew to be a dominion. In consequence of this they were subjected to the judicature of the lord.

Finally we should remember that the Church, with everything pertaining to her, also lived under a law and clerical jurisdiction of her own.

In this manner law in the Middle Ages offers a variegated image of a division into several jurisdictions. Still the judicial thoughts as a rule show the most obvious signs of

affinity, and it is not difficult to discover one fundamental thought from which they are all derived. We may in this sense speak of an indigenous law, in which the original unity in the law and in the idea of justice grew to be more and more diversified, owing to the influence of social relations and special economic interests, coming to the fore in each of those jurisdictions.

The second period begins when the complex of small States and manors of the Middle Ages is growing into the modern State. The power of the lord increased with the expiration of feudalism, and reached its highest point when in the sixteenth century the Burgundo-Austrian princes (Charles the Fifth and Philip the Second) had united all the Netherlands States under their government. While striving for a centralisation in government, they endeavoured to introduce order and unity into the administration of justice by means of reforms and the issue of common national ordinances. Here they were opposed by the towns especially, which having grown rich and powerful, wished to preserve their independence, and it was this desire that in the end prevented their attempts from being successful. Characteristic of this time is the intrusion of Roman law, such as it had developed in the Middle Ages through science and legal practice in Italy. The bad, confused condition of justice at home, of judicature rather than of material law, was conducive to the influence of foreign law, and we may assume that these defects gave a greater push in that direction than the intrinsic merits of the Roman law. The influence of jurists also affected this. This influence dates from the Burgundian time; both in government and in jurisdiction they more and more take the place of the lay courts of justice. As regards jurisdiction, we notice this change first in the higher Courts of Justice; the highest judicial power in the different provinces comes into the hands of courts whose organisation was established in the reign of Charles V, and which in the end only consisted of professional judges versed in the law. In the lower courts also jurisdiction by lawyers comes more and more to the front after the decline of princely power (end of the

sixteenth century) and during the time of the Republic of the United Netherlands (1581—1795).

The law they applied and advocated was the Roman law, the only thing they had learned, the only thing that was taught by men of science and was treated in writing. The Netherlands school of lawyers was formed by Romanists; the greatest among them did not look down so much upon the original Netherlands law as the lesser scholars, and in general the pupil went further in one-sided glorification of the foreign law than the master. In consequence of this the old Netherlands law — if not forcibly extinguished — lost its freshness and vital power, and the law grew to be a doctrine of subtleties, from which the people were estranged.

Love and knowledge of the old law of their forefathers still speaks from the works of two Overijssel scholars: MELCHIOR WINHOFF and HERMAN CROESER. The former (deceased about 1580) gave a composition of the "Landrecht" of Overijssel, which has maintained its authority in following centuries, and whose influence on the legislation in his province in the seventeenth century could be clearly discerned. HERMAN CROESER, probably a pupil of the University of Orleans and deceased in 1574, drew up a scheme for a Municipal law of Kampen, which however never became law. In this work he gave a description of the Civil Procedure and Penal law of his native town which was meant to be a complete codification.

As the greatest of the next Romanist school we mention: NICOLAËS EVERHARDI (deceased in 1532¹), VIGLIUS VAN AYTTE (deceased in 1577), HUGO DE GROOT (deceased in 1645), ULRIK HUBER (deceased in 1694), SIMON VAN LEEUWEN, (deceased in 1682), JOHANNES VOET (deceased in 1714), GERARD NOODT (deceased in 1725), and CORNELIS VAN BIJNKERSHOEK (deceased in 1743). EVERHARDI, president of the highest court of justice in the Netherlands and ancestor of a numerous and famous family of jurists, created in his "Topica juris" a method, as highly praised by some as it was disdained by others, which — if it had found imitation — would certainly have become of lasting significance. VIGLIUS and NOODT are exclusively scholars of Roman law, but as such belong to the

stars. Of VIGLIUS it may be said that he showed the direction in which the Netherlands school, following the French, should move, that of the study of the sources of the law itself. Though much credit should be given to the Netherlands school for this study, the remark has not unjustly been made that they proceeded more as antiquarians than as jurists. GERARD NOODT, who devoted his life to education and was a professor at Leyden for forty years, was a follower of the school of CUJACIUS, and his best work is in so-called "elegant" jurisprudence. By his side are others who described the law as they saw it practised around them, though they looked through Roman spectacles. DE GROOT wrote the famous "Inleiding tot de Hollandsche Rechtsgeleerdheid" (Introduction to Netherlands Jurisprudence), which is excellent because of its clearness and simplicity; HUBER sketched "De Hedendaagsche Rechtsgeleerdheid" (The Jurisprudence of The Present Day), in a more dogmatic fashion, and VAN LEEUWEN "Het Roomsche-Hollandsche Recht" (Roman-Netherlands law). This last work, together with the much more Roman book of VOET (a commentary ad Pandectas) is the work on Netherlands law at the time of the Republic that is still most generally consulted. VAN BIJNKERSHOEK of Zealand, a sagacious magistrate, found, in spite of his function as President of the "Hooge Raad" (Chief Council), an opportunity to compose a series of valuable writings, one of which gave us the following maxim: "potestatem terrae finiri, ubi finitur armorum vis" — the truth of which is now-a-days recognised.

Just as jurisprudence was deeply coloured by Roman law, so had education been led in that direction. In the University of Leyden, founded in 1575, they taught exclusively Roman law as far as Civil law was concerned, and the same state of things may be noticed at the universities of Groningen, Utrecht and Harderwyk, erected in the seventeenth century, and at the Frisian University of Franeker. The examinations, disputations and graduations were about parts of the "Corpus Juris", the natural consequence of which was that a degree gave no guarantee of practical ability, but was simply an ornament of theoretic learning. Hence for a long

time it continued to be the custom to take one's degree at a foreign university : the foreign law could be learned there as well as at home. But in the seventeenth and eighteenth cent-



Promotion "cum cappa."

uries there comes a change : a place, though a very modest one, is yielded to the national law in the universities, and

now on the contrary a great number of foreigners, especially Germans, attend the Netherlands universities. The eminent professors teaching in our universities, many of whom were famous all over the world, attracted the foreigners. We have already spoken of GERARD NOODT, but may still mention the famous HUGO DONELLUS, who worked for some years at Leyden, BÖCKELMANN, ARNOLD VINNIUS and JOHANNES VOET at Leyden, the BOURICIUSES, the HUBERS, the PAGENSTECHEERS and CORNELIS VAN ECK, who was the teacher of VAN BIJNKERSHOEK. Amongst those of special renown on account of their many foreign pupils, were in the eighteenth century: ANTONIUS SCHULTINGH, JOHANNES ORTWINUS WESTENBERG, and for public law PESTEL, the author of the first great work on Netherlands public law. The latter part of the eighteenth century could boast of VAN DER KEESSEL, who wrote an important supplement to DE GROOT's "Inleiding tot de Hollandsche Rechtsgeleerdheid".

The study of international law and of the law of nations flourished especially in the seventeenth century. With regard to the first, the Netherlands school has formed a doctrine of its own, the creators of which were PAULUS VOET and the Utrecht councillor CHRISTIAAN RODENBURG, besides the above-mentioned JOHANNES VOET and HUBER. As regards the law of nations, a foremost place is taken by DE GROOT with his famous work "De Jure Belli ac Pacis" (1625), which for many centuries formed the basis for the study of the law of nations. The second place is taken by DIRK GRASWINCKEL, like DE GROOT a native of Delft, who wrote about the supreme rights of the State — though his work is of less importance.

We should not forget that the influence which the foreign law possessed in theory, far surpassed that which it possessed in practice, in the every-day application of the law. Here the old Netherlands law could not be pushed into the corner to such an extent as was possible in the study. We can only say that it suffered under the oppression of the foreign law and gradually lost its vital power; but in several respects, and in more than one sub-part, it showed its tenacity, and maintained itself.

This was partly due to the improvements made in the law by the legislation of the provinces and towns. For in the seventeenth century these strongly took up reformation and codification. A foremost place is here taken by the provincial codifications of Drenthe (of 1608, 1614 and 1712), Friesland (of 1602 and 1723), and Overijssel (of 1630) and by the "Land-rechten" in the seventeenth century of the different parts of Gelderland and Groningen. Other provinces did not get as far as codification, but they laid down a few general ordinances of importance. Of the towns that followed in the regulation of their law, we ought to mention: Middelburg, 's-Hertogenbosch, Maastricht, Leyden, Gouda, Tiel, Zutphen, Harderwyk, Deventer and Zwolle — to conclude by pointing to the highly important commercial ordinances of Amsterdam and Rotterdam. In spite of all this, the general condition of justice during the period of the Republic remained confused, uncertain and unsatisfactory. The Penal law and the law of Procedure, which were strongly influenced by politics and political rivalry among the different parts of the State, were especially in a bad condition.

The eighteenth century, with its spirit of criticism, shows us the first serious doubts as to whether it was right that Roman law should have such a prevailing influence. The Groningen professor FREDERIK ADOLF VAN DER MARCK stood foremost in this respect, and is of importance as a student of the special law of Groningen. The school of Natural Law also formed at this time a reaction against the confusion and uncertainty by which the law was characterised, which they imputed to the maintenance of the many foreign and antiquated ideas of justice. They tried to find in Reason the source of a new kind of law, destined for all times and peoples. The one-sidedness of this school and their breaking with every historical rule caused their attempts to fail in the end.

The Republic of the United Netherlands went down beneath its own shortcomings and its discords. Purified by the intermediate French period, it was reorganised as the Kingdom of the Netherlands in 1813. During that time people had learned to value the advantages of the unity

State, and they could profit by this knowledge also with regard to justice and jurisdiction. The unity State, organically divided into provinces and communities, grew through the genius of JOHAN RUDOLF THORBECKE to be the State we know at present. It is to his influence more than to any other that we owe the Constitution of 1848, which made the form of government into a constitutional monarchy, based on the principle of ministerial responsibility and the representative system. After this, THORBECKE became the creator of the Provincial law of 1850 and the Municipal law of 1851 — both founded on the Constitution of 1848 — whose fundamental idea is this: that Province and Municipality have no sovereignty of their own, but have an independence, under the highest authority of the State, which allows autonomy and self-government, but goes no further than is compatible with the preservation of the unity of the State. The present Constitution of 1887 has been built on the one whose foundations were laid in 1848: when it was made, the regulation of elective franchise was the principal point.

Public law is described in the different writings of THORBECKE, and from another political side in the works of the statesman and creator of the anti-revolutionary science of politics, GUILLAUME GROEN VAN PRINSTERER, THORBECKE's contemporary. Besides this, the book "De Grondwet" (the Constitution) of the Leyden professor BUYS is of special importance for theory, whilst a separate place is occupied by the description of "Onze Constitutie" (Our Constitution) by the still living Minister of State, Jhr. DE SAVORNIN LOHMAN.

The unity State brought the need of a common Civil and Penal law and a law of Procedure that should be connected with this. After 1813 the French codes that had been introduced in this country, were at first maintained, but the work of national legislation was strongly taken in hand. Professor JOHAN MELCHIOR KEMPER had a great influence on the composition of this legislation and the way in which it was formulated. In 1814 he was appointed President of the Commission for its composition, which in the same year presented to the King a plan for a Criminal Code, a Com-

mercial Code and one for the manner of procedure. KEMPER worked chiefly on the Civil law. With regard to this he advocated the construction of an original Netherlands Code, while the majority of the Commission wanted to have nothing but a Netherlands revision of the French "Code Civil". In principle the King agreed with KEMPER's opinion. In the end a Civil Code, a Commercial Code and a Code of Civil Procedure were composed and became law in 1838. They were for the greater part imitations of the French codes, which themselves were formed on a Roman basis. It is true, with respect to several subjects modifications were made in the laws of the French codes; there was sometimes a return to the provisions of the old Netherlands law, and new provisions were added here and there; but considered as a whole the legislation of 1838 is of a French cast. Regarding the Commercial Code we must specially point out the fact that in many respects it follows more closely the law of the time of the Republic, where it found a model in the excellent commercial ordinances of the Republic, so well reputed as a commercial nation. For the rest this revision of the French codes, which according to form and language created an entirely new legislation, was often very defective, and it has not unjustly been condemned that in the composition of the Netherlands codes they neglected in our country to profit by what literature and jurisprudence had shown to be defects in the French codes, which had been in operation for many years.

The "Code Pénal" was also maintained after 1838, and only a few important modifications have been made; for instance, capital punishment was abolished in 1865. It was as late as 1886 that a national Penal Code came into force; this excellent piece of legislation is due to the Leyden professor and Minister of Justice Mr. MODDERMAN.

The administration of justice is in the hands of tribunals, composed of professional lawyers, united under a supreme Court of Justice, the "Hooge Raad der Nederlanden", in substance what the French call a "Cour de Cassation." Without doubt the civil legislation of 1838 did not give to the national law the place to which it was entitled; it is antiquated,

notwithstanding it has been partly revised; but apparently not so antiquated that plans for a revision of the whole meet with approval among lawyers. Owing especially to the influence of what is seen abroad, there is a keener desire for a revision of the civil law of procedure. Meanwhile, opinions are divided as to whether it would be desirable to follow the Austrian or English example. State Commissions have been formed several times, whose task it was to plan new codes, but it never got beyond plans. Nearest at hand — and indeed particularly necessary — seems the revision of the law of criminal procedure. As concerns the material law, military penal law, antiquated for more than a century, was regulated anew by a code that has been waiting for years to be put in force. It was made under the auspices of the ex-professor VAN DER HOEVEN. In reality military criminal procedure is still moving in the garb of the law as it stood at the time of the Republic, which was only partly revised by an Act of 1912.

In this way legislation lags more and more behind the requirements, because of the slowness of the legislative machine; that which the legislator does not give, is expected from the judges: a justice and jurisdiction that satisfy the wants of the time. That the study of the civil law suffers from this, is not to be denied. Unsatisfied, attention has to a considerable extent passed from the civil law on to the public and administrative law — to which, moreover, attention has been drawn in many ways. Even before this, the interest in Roman law was diminishing, whereas that in the old Netherlands law in its historical signification has been increasing since the middle of the nineteenth century.

If we take a still closer survey of jurisprudence and juridical education in this country during the nineteenth century, we notice that even in the opening days the ideas of those who wished to regard the instruction in Roman law at the universities not as an aim, but exclusively as a means, were gaining ground. The historical school, such as had developed in Germany under HUGO and VON SAVIGNY, also found strong adherence in this country and was

advocated at the universities by more than one professor; we mention among others the well-known Utrecht professor HOLTJUS. We find a decrease in the number of Romanists in the latter part of the nineteenth century, after the study of Roman law had been pushed into the background under the present regulation of university education. It is only in his first year that the law student learns anything about Roman law; after this it disappears for ever from the series of subjects and — it almost goes without saying — also from the student's attention. Among these few Romanists we may mention the Groningen professor MODDERMAN, who besides giving a sketch of the reception of Roman law — which has gained much fame in foreign countries — wrote a manual for the study of that law which — afterwards completed by his successors — is at present still the only one that is generally used.

Since the enforcement of the national codes, the study of Netherlands law has been characterised by an enthusiasm for codification, and since the middle of the nineteenth century by a methodology which acknowledges and cherishes the statute-law and nothing but this law, as the source of civil law and as its only source. Even after history gradually regained its rights, the statute-law still remained the watch-word: it was and is the starting-point of the two great commentators OPZOOMER and DIEPHUIS. On the other hand, we meet with a broader spirit in the big work on civil law by the Groningen professor LAND (who also works in history), which is a quarter of a century younger and the latest book published on this subject. But gradually the want of enthusiasm for the science of private law becomes more and more visible, and science experiences a drawback in the backwardness of legislation and the often insufficient accessibility of the judges on matters of social wants and — as a consequence of this — the ever-widening gulf between law and people. In order to find freshness and originality one should read the numerous essays of the recently-deceased Utrecht professor, HAMAKER.

With regard to private law, the instruction at our universities is of such a kind that reforms are thought highly

necessary; the chief desire is to bring instruction into closer contact with practical life.

We noticed a decline in the study of the history of Roman law; the study of the old Netherlands law and its history has become of greater importance since the middle of the nineteenth century. Under the direction of the professors DE GEER VAN JUTPHAAS, FRUIN and POLS (all of Utrecht), and afterwards of the Utrecht archivist MULLER and the Leyden professor FOCKEMA ANDREAE, the publication of our old legal sources and the study of the old Netherlands law attained new prominence.

As already observed, attention has in some respects passed from private law to public and administrative law; men of universal knowledge, like JOHAN DE WAL and DE PINTO, were also first in this matter. The present State Counsellor, Mr. OPPENHEIM, the profound scholar and describer of Netherlands municipal law, was the founder of a school. We have already spoken of BUYS and will still mention the Groningen professor TELLEGEN. As a teacher of Penal law VAN HAMEL, for many years a professor at Amsterdam, has added lustre to the Netherlands name at home and abroad. Together with the Belgian PRINS and Professor VON LISZT, of Berlin, he formed the International Society of Penal Law.

The international place of the Netherlands in the field of jurisprudence was strengthened, if by anything, by the codification of international law, with which a beginning was made by ASSER. May the future give it a more peaceful field of work than is at present the case!

MEDICAL SCIENCE IN THE NETHERLANDS BY E. C. VAN LEERSUM.

AT the foundation of the Universities the number of teachers was naturally small. There were, of course, only few teachers available at that time. This applies especially to the Faculty of Medicine, which had to be satisfied with one single professor. At Leiden Professor GERAERT DE BONT (BONTIUS) had charge of the complete education of the medical students. Curiously enough his first pupil was an Englishman, JACOBUS JAIMES, who had himself entered as a student of medicine on April 21st of the year 1578. His example was followed in 1596 by no fewer than five of his fellow-countrymen, and with these young men began to flow the wide stream of foreigners who, in the course of time, have come to hear the famous Leiden professors. That this stream gradually dried up, is by no means because present university education in the Netherlands is less attractive and excellent than it used to be, but because there, just as elsewhere, Latin, the old language of scholars, had to give way to the native language. But this barrier only affects the lectures and not in the least the intercourse in the laboratories, for there the foreigner, thanks to the Netherlander's well-known talent for foreign languages, is sure to find several people sufficiently acquainted with his native tongue to converse with him. Foreign scientists who come to work in the Netherlands laboratories, are therefore no longer the exceptions.

The Anglo-Saxon race has always been best represented among the visitors of the Netherlands universities. Of the 137 students who graduated at Leiden University in the first 50 years of its existence, no fewer than 21 were Englishmen, as compared with 11 Germans, 2 Frenchmen, 2 Danes and 1 Italian.

The Groningen University could also boast at first of

only one medical professor, viz. NIC. MULERIUS. How close the relations with Great Britain were also in the northern part of the country, is shown by the appointment of the Scotch scholar WILLIAM MACDOWEL, of St. Andrews, as Professor of physics and metaphysics.

Utrecht's first and, at first, sole representative of the medical faculty was WILLEM VAN DER STRATEN (STRATENUS), mentioned by many — although not on sufficient grounds — as the first Netherlands professor who taught clinics, that is, gave practical medical instruction at the bedside. And here too it was many years before another was appointed besides him. This was HENRICUS DE ROY (REGIUS), who caused a good deal of commotion as a defender of the Cartesian philosophy, but who should especially be mentioned here because, following SYLVIVS, DE WALE and other Netherlands medical scholars, he defended HARVEY's doctrine of the circulation of the blood and did much for the development of this very important view. There were at the start but very few students at Utrecht; during the first five years of the existence of this university the number was not more than 35.

At Franeker ALARDUS AULETIUS was the first medical professor, and here, just as elsewhere, the number of students was at first very small. From 1589, the year of his appointment, till 1603, AULETIUS had in all 38 pupils. The first Englishman came to the university in 1593; the German nation was represented by the greatest number, but representatives of many other European nations were also found there, even one from distant Morocco.

Harderwijk, the youngest of the four universities in the North of the Netherlands, had JACOBUS KOCHIUS as its first professor of medicine. This university has not always been of good repute. There was a time when people mockingly said:

“Harderwijk is een stad van negotie,
Men verkoopt er bokking, blauwbessen en bullen van promotie.”

(Harderwyk is a commercial town where they sell bloaters, bilberries and doctors' certificates).

But this school was not an exception in that respect, and

we only refer to the case in order to point out an abuse which was general at that time, and may still exist — fortunately not in the Netherlands, however. The famous French medical scholar GUY PATIN expressed himself in this way about it: "Le parchemin qu'ils (the young doctors) rapportent des universités est une marque certaine de l'argent, qu'ils y ont laissé; mais la science requise à leur art, où est-ce qu'elle se trouve à vendre?" Meanwhile, there have been times also when people considered it an honour to possess the Harderwijk "Cap", otherwise the great BOERHAAVE would not have taken his degree at Harderwijk.

Several circumstances contributed to make all these schools highly prosperous and procure for them a foremost place amongst foreign institutions for university education. The tried spirit of liberty of the people in the Northern Netherlands offered free-thinking foreigners a guarantee that even the most sceptical among them would meet with a kind reception and find unlimited liberty of thought. The governors wisely understood that intercourse with foreigners gives our young men broader views, and so they tried to draw students from abroad by attractive regulations and institutions. They were always bent on engaging the best teachers for their universities, and being very well acquainted with what was going on abroad in the domain of natural science, and not biassed by too narrow national sentiment, they succeeded in making wise choices and never hesitated to offer the most favourable and tempting terms whenever they might win for their school some celebrity or fortunate owner of valuable scientific collections. The Leiden governors soon gave evidence of this broad view by appointing the herbalist REMBERT DODOENS (DODONAEUS) of the Southern Netherlands, teacher of medicine, and conferring the title of Professor Honorarius upon the world-famous botanist JULES CHARLES DE L'ECLUSE (CAROLUS CLUSIUS), which latter appointment was made apparently with the sole purpose of adding greater lustre to the name of the University, for CLUSIUS had a weak constitution and his health was so bad that he had to be excused from teaching. They further used to organise competitions for those scholars who were

considered likely candidates for a vacancy, to ascertain which was best qualified for the position.

The governors extended their care not only to the teaching profession, but also to the equipment of the universities. The Netherlands scientific collections have been famous at all times, for the governors spared neither costs nor trouble to make them as complete as possible. The great commercial companies were able to offer important contributions to these collections, thanks to their numerous relations with oversea countries, and sometimes it seemed that the university governors tried to attain the same end by the indirect means of an appointment. Thus the governors of Leiden university doubtless had their eye in the first place on his rich collection when they tried to persuade the Enkhuizen physician, BERNARDUS PALUDANUS, to accept a professorship in botany and superintend the Hortus botanicus. The Leiden hortus acquired great renown by its wealth of exotic plants and not less by the excellent teaching of men like HERMANN and BOERHAAVE.

Equally famous were the anatomical collections, especially the one at Leiden and the private collection of FREDERIK RUYSCH, the Amsterdam anatomist, who was undoubtedly one of the best preparators and dissectors who ever served the science of anatomy. This is strikingly demonstrated by the fact that RUYSCH's collection was sold to the Czar PETER for 30,000 guilders (\$ 12,000) — an enormous sum for those days! — and that within ten years he had another ready, which he was able to sell to the Polish king JOHAN SOBIESKI for 20,000 guilders (\$ 8,000).

RUYSCH's anatomical preparations were simply miraculous in their natural outward appearance. The freshness of the face of a child's corpse conserved by him carried the Czar away to such an extent that he kissed it on both cheeks! "Les momies de M. RUYSCH", says the learned FONTENELLE, "prolongeoient en quelque sorte la vie, au lieu que celles de l'ancienne Egypte ne prolongeoient que la mort."

Those valuable proofs of the Netherlands art of preparation have perished, but fortunately some beautiful anatomical objects of the Leiden anatomists ALBINUS and

SANDIFORT have been saved and are protected from further ruin in the Leiden "Anatomisch Kabinet."

The old Netherlands art of preparation, which is even today admired by experts, is the result of the special preference with which anatomy was practised in the Netherlands. It accords with the conscientious nature of the Netherlander to start from the very foundation of a science by teaching from obvious facts. Hence Anatomy and the Clinics became the glory of Netherlands medical instruction. Anatomical instruction in the 16th century left almost everything to be desired in most of the European schools — those in the North of Italy excepted — and the student who wished to study the structure of the human body, had to resort to imperfect illustrations and incomplete, inaccurate descriptions. It was only very seldom — sometimes with an interval of many years — in a few of the large universities, such as Paris or Montpellier, that a subject was opened by the incompetent hand of an assistant — for the professor himself considered this work beneath him — and a very superficial examination of the internal parts was allowed. The practical nature of the Netherlands anatomists made them see that the study of a science which asked so much of the student's imaginative power could only be served by object lessons, and no trouble was therefore too much for them to procure material, which was closely examined down to the smallest details. To this we owe the great number of their anatomical discoveries. Not content with their own studies, but at the same time actuated by the desire to give permanence to the results of their labour for the benefit of others, they also published works on anatomy, and of these it may be said that they are among the best and finest books on the subject. When they were not themselves experts in the art of drawing — like the famous anatomist PETRUS CAMPER — they secured the assistance of eminent artists, as did VESALIUS — to give an illustrious example — who for the illustration of his matchless work called in the aid of the great JAN STEPHAN VAN CALCAR, TITIAN's pupil. That BERNHARD SIEGFRIED ALBINUS's large anatomical atlas approaches perfection, is to be attributed in no small degree to the assistance of the exceedingly clever



Demonstration in Anatomy by Professor PETRUS PAVIUS (PIETER PAUW, 1564–1617).

and conscientious artist JAN WANDELAAR. The able GERARD DE LAIRESSE devoted his talents to the pictures of the valuable atlas of GODFRIED BIDLOO, which was afterwards published under WILLIAM COWPER's name.

How popular the science of Anatomy was in the Netherlands, is proved by the numerous pictures called Anatomical Lessons, of which most glorious specimens may be seen in almost every museum. Indeed, no more beautiful and dignified homage could have been paid to Netherlands anatomists than by the brush of a REMBRANDT (Anatomical Lesson and Dr. DEYMAN's Anatomy), a GERRIT DOU (VESALIUS's Anatomy), a MIEREVELT (Anatomical Lesson of Doctor VAN DER NEER), an ADRIAEN BACKER and JOHAN VAN NECK (Anatomy of FREDERIK RUYSCH) and so many others who form the glory of the Netherlands school of painters.

PIETER PAAW is the best-known anatomist in the earlier years of the Leiden university, and he fully deserves this distinction, because he has done so much for practical instruction. In one of the old pictures of the Leiden theatrum anatomicum we see PAAW represented in the midst of objects of all kinds and of diverse origin and surrounded by a crowd of spectators, whose variety of costume reminds us of the many foreigners attracted by his excellent teaching.

The case of the ALBINUS, father and sons, confirms what was said before, that the Netherlands authorities, bearing in mind the fact that knowledge and science know no geographical boundaries, did not allow themselves to be influenced by any narrow-minded patriotism when filling the chairs with the best teachers. BERNHARD WEISS (ALBINUS), who first — but in vain — was called to a chair at Groningen and afterwards became a professor of medicine at Leiden, was a native of Dessau. His son, CHRISTIAAN BERNHARD, who was charged with the teaching of anatomy and medical practice at Utrecht, was born at Berlin. Another son, BERNHARD SIEGFRIED, born at Frankfurt, to whose anatomical atlas we have already referred, was certainly one of the greatest anatomists who taught in the Leiden University, and after his death he was succeeded by the youngest of the three, FRIEDRICH BERNHARD.

SYLVIUS, the well-known clinical professor and famous representative of the Chemiatic School, was also of foreign extraction. In order to prove that even now-a-days the authorities are not at all averse to appointing foreigners in Netherlands universities, we may mention the names of three of BILLROTH's best pupils, SALZER, VON EISELSBERG and NARATH, who in many ways contributed to the development of modern operative surgery in the Netherlands. But in its turn this small country gave to others a MOLESCHOTT (Italy), a VAN 'T HOFF (Germany) and a WENCKEBACH (Austria).

The name of SYLVIUS puts us in mind of another institution which contributed in a high degree to the reputation of Netherlands medical men. We mean the custom of teaching at the bedside. It was for a long time held that in the Netherlands this kind of instruction was first of all given at Utrecht University. The fact is that on March 17th, 1636, the Utrecht professor, WILLEM VAN DER STRATEN, intimated in an oration that he intended to give students an opportunity of examining patients and of learning how to make a diagnosis, but whether he carried out his intention is nowhere stated. On the other hand it appears from an authentic document, discovered a few years ago, namely a Resolution of the Leiden governors of December 4th, 1591, that even at that time, as much as 40 years earlier than at Utrecht, some people's minds were occupied with the same problem: and indeed, taking into consideration the well-known diligence of the Leiden governors of that time, it is not impossible, but even very probable, that a beginning was made with the plan the faculty had proposed to the board. However this may be, clinical teaching soon became a general practice in the Netherlands, which contributed not a little to the respect for the education in this country. For, with the exception of a few Universities in the North of Italy, where a patient was sometimes shown to the audience, there was nowhere in Europe an opportunity for qualifying oneself in the examination of patients, unless one became the private pupil of some physician and visited patients in their homes with him. This, however, was an unsatisfactory proceeding, as there could be no question of regular observation of the progress of a disease or checking



Sint Cecilia-Gasthuis at Leiden, the Hospital where HERMAN BOERHAAVE (1668—1738)
gave his Clinical Lectures.

the diagnosis after death. The advantage of practical teaching lay in the fact that students were given the opportunity of seeing patients regularly and noticing the effect of the treatment with their own eyes, whilst dissection after death enabled them to judge of the changes brought about in the organism by diseases. It so happens that we still know in what manner these practical lessons were given, and the place where the master of medical clinical teaching, HERMAN BOERHAAVE, devoted himself to this, has also been preserved. BOERHAAVE's most celebrated pupil, GERARD VAN SWIETEN, who was appointed physician to the Empress MARIA THERESA of Austria and charged with the reform of medical education in Vienna, was familiar with a system of shorthand, in use in England, and so able to take down literally the lessons of his great master. These valuable notes are kept in the Imperial Library at Vienna and have partly been deciphered*). (See pp. 72—73).

Whereas SYLVIVS had succeeded in gathering a large Netherlands and foreign audience around him by his interesting lectures, the stream of pupils flowing to the Leiden University, increased yet more under the eloquent BOERHAAVE. Among his pupils were the most celebrated men of that time, LINNAEUS and HALLER, PRINGLE and RIBEIRO SANCHEZ, to mention but these few. Monarchs like the Czar PETER, who visited the Netherlands, also came to Leiden to make the acquaintance of Europe's medical teacher, and from distant parts sick people came flocking to him, in the hope of being cured of their diseases under his treatment. How highly BOERHAAVE's school was valued abroad, is proved by the appointment of BOERHAAVE's pupils, VAN SWIETEN and DE HAEN, at Vienna. The former, as the Empress's confidant, possessed power and means to release education at Vienna from oppressive reactionary bonds and entirely reform it, whilst the latter, continuing the work of his fellow-countryman, laid the foundations of the greatness of the Vienna

*) For this cf. an essay, dedicated to the Saint Louis Medical History Club, in Janus, Archives Intern. p. l'Histoire d.l. Médecine, etc XVe Ann., 1910, and another one in XVIIe Ann., 1912.

clinical school, at the same period in which the famous JACQUIN taught Chemistry and Botany there, and the naturalist INGENHOUSZ, the discoverer of the secret of the respiration of plants and of the microscope cover-glass, advocated the application of vaccination against small-pox.

This cover glass, the inconsiderable, but for the microscopist indispensable appliance by which he protects his minute objects, leads us to another branch of science where the Netherlands proved entirely at home.

We refer to the domain of the infinitely small, which cannot be examined with the naked eye. The question as to who invented the microscope, need not detain us here, the less so as Netherlands scholars can already boast discoveries enough with regard to this. Many still think the Middelburg SACHARIAS JANSEN to be the ingenious man who, with or without his father's help, in 1590 invented the microscope, composed of two lenses. But this is of the less importance here, as the first great discoveries in this branch of science were made by means of a single lens. It was the modest usher of the "schepenen" (aldermen) of Delft, ANTHONY VAN LEEUWENHOEK, who by means of simple little lenses, which he had to grind himself with infinite patience, succeeded in making a long series of discoveries. Among these are some of the utmost importance, as for instance that of bacteria and infusoria and the capillary circulation of the blood. Another pioneer in the field of Entomology should be mentioned here, JAN SWAMMERDAM, the modest naturalist, who preferred poverty to the luxurious court of COSMO DE MEDICI, and who acquired eternal fame by his *Biblia naturae*, in which he recorded his numerous observations.

Though we have hurried across the field which the Netherlands medical scholars so successfully cultivated, our survey is by no means complete. We ought to mention more names, such as REINIER DE GRAAFF and HENDRIK VAN DEVENTER, the latter of whom stands in the first rank in obstetrics. But space is limited, and we find ourselves compelled to take leave of the Medical Netherlands of former ages in order to pay a short visit to the Medical Netherlands of today.

One of America's greatest sons once said: "No man e'er was glorious who was not laborious!" Though the Netherlander is entirely justified in glorying in his scientific forefathers, he would soon disgrace his good name if he were to think that he may rest on the laurels they won. The Netherlander has been able to learn from his ancestors that the gods help those who help themselves, and a glance at the scientific Netherlands of the present time will show us that this race of diligent and ingenious workers is not yet extinct.

On the surface it seems as if it fell behind during the 18th and 19th centuries, at least judged by the standard which ALPHONSE DECANDOLLE used for fixing the scientific value of a nation, namely by ascertaining how many of its sons formed part of the principal learned societies, such as the Royal Society and the Académie des Sciences. One would then have to agree perhaps with the famous botanist, that the Netherlands gradually lost its scientific significance. But this only applies to the first half of the 19th century, when the country had still to recover from calamitous party strife and the French rule that succeeded them. After this there was fortunately a turn of the tide, and DECANDOLLE's prophecy that a return of the old scientific glory might be expected in the Netherlands has come true. This can be proved convincingly by another standard which may be just as safely used when judging the state of science, namely the Nobel prize, which has already been carried off by no fewer than four Netherlands scientists, a number which, taking into consideration the small number of inhabitants of the country, surpasses that of other nations, relatively and almost absolutely too.

As far as medicine is concerned, we may boast of a continuous development in the Netherlands. This is due for a considerable part to what a VAN 'T HOFF and a HUGO DE VRIES achieved in cognate branches of learning, physics and biology.

The fundamental parts of medicine, anatomy and physiology have once more, as in former times, exercised their power of attraction on the younger scientific Netherlands.

In BOLK and WINKLER anatomy found once more

brilliant exponents; whilst with respect to physiology, the name of DONDERS is sufficient to recall the glorious times of former ages. DONDERS, one of the greatest physiologists of his time and an oculist of great eminence, made Utrecht, the town where he lived, a meeting-place of young scholars, among whom were many from abroad.

One of DONDERS'S contemporaries, GERRIT JAN MULDER, known among other things for his controversy with the master of chemistry, VON LIEBIG, is the Netherlands' first modern physiological chemist. Up to a few years ago physiological chemistry and pharmacology were taught at Amsterdam by STOKVIS, who was also highly esteemed abroad, whilst at the present moment the first-mentioned branch of science finds an experimenter of the first order in the eminent and thorough PEKELHARING.

Of DONDERS'S numerous pupils W. EINTHOVEN and H. J. HAMBURGER are undoubtedly the best known.

The name of the former is among other things connected with the string-galvanometer, the extremely sensitive instrument, known all over the world, with which one can examine the electric phenomena accompanying the action of the heart. The latter's discoveries on the influence of salt solutions on the blood corpuscles, gave rise to an entirely new and promising branch of science, physico-chemical biology. How much HAMBURGER'S work is appreciated abroad, was proved at the successful Congress of physiologists at Groningen in 1913, where he occupied the chair and was honoured by the leaders of biological science, among whom were several well-known American scientists.

The practical parts of medicine are also in a flourishing condition. Internal clinics may boast great men like TALMA, PEL and WENCKEBACH, the latter of whom was lately appointed first at Strassburg, then at Vienna.

Conscientious surgeons like KORTEWEG and ROTGANS apply themselves to their profession in a scientific manner and add daring to old-Netherlands cautiousness. And the art of a VAN DEVENTER finds a worthy representative in the witty and capable HECTOR TREUB.

It is to men of this kind that the education of future medical men in the Netherlands is today entrusted.

The number of medical professors is 50 in all, 9 of whom are extraordinary ones. The Leiden faculty has 10 ordinary and 3 extraordinary professors, besides 2 lecturers and 6 private lecturers. Utrecht possesses 11 professors, 8 lecturers and 5 private lecturers. Groningen numbers 9 professors, 2 extraordinary professors, besides 1 lecturer and 5 private lecturers; whilst the Amsterdam faculty has 11 professors, 4 extraordinary professors and 18 private lecturers.

With one or two exceptions the equipments and arrangements for instruction may be called good, some even very good. Utrecht and Groningen possess excellent hospitals and laboratories, fitted up according to modern requirements. Leiden and Amsterdam will soon find themselves in the possession of new hospitals and laboratories. The Groningen laboratories especially may be called excellent, and the new physiological laboratory in that place surpasses the best that foreign countries are able to show in this respect.

These universities are attended by rather more than 1,800 medical students, among whom there are no fewer than 175 women. At the present time Amsterdam draws the greatest number, viz. 530. This populous city, with its trade and shipping, naturally provides abundant material for the hospitals, to the great benefit of the teaching. Next comes the University of Utrecht, favourably situated in the centre of the country, with a number of students almost as large as at Amsterdam. Leiden numbers more than 300 medical students and Groningen more than 200. The education of these students is scientific in the full sense of the word. It takes about 7 years, of which one or two are given to the study of physics, chemistry, botany and zoology, two to the study of anatomy, histology, physiology, pathology and pharmacognosy, and about three to theoretical medicine, pathological anatomy, hygienics, pharmacology and the practice of medicine, surgery, midwifery and ophthalmology. In Leiden the instruction also includes the history of medicine, and with good reason, for a considerable part of this history is made by Netherlanders.

Foreign students are the exception at the lectures, because the use of the native language prevents their following the lessons with success. But, as mentioned above, this does not apply to the laboratories; those who work there can generally make themselves understood in two or three foreign languages. The knowledge of these is promoted by the reading of foreign literature, which is common in the Netherlands. At the present moment, next to Netherlands books and periodicals, German literature prevails, because German publishers take more pains to push their works than the English, American and French. If the American publishers were to exert themselves as much, they would certainly find many purchasers in the Netherlands, for the Netherlander knows how to prize the work of the American naturalists and medical scholars, besides feeling himself drawn to the American people on account of race affinity, similarity of character and former relations. It is to be hoped that the ties which have for many centuries bound the two nations together, may become closer and closer, especially with regard to science, for intellectual bonds are the most enduring.

5. 17 $\frac{2}{21}$ 37

Болерн

The last letter I wrote to you - I hope
you have received it. I am now at home
and will be able to write more fully.
I am very well and hope you are the same.
I am your affectionate friend,
John G. Thompson

[The handwriting in this block is extremely faint and illegible.]

1621 - 1871
 1871 - 1872
 1872 - 1873

Shorthand notes of a clinical lecture of BOERHAAVE, taken by GERARD VAN SWIETEN (1700-1772), physician to the Empress MARIA THERESA.

A transcription of these is also appended.

Lectiones practicae in Nosocomio habitae.

Lectio 1a, 17 $\frac{9}{21}$ 37.

66 annorum senex.

1. Debemus examinare symptomata tam morbosa quam quae a natura supersunt ima ex sanitate.
2. primo attendamus ad vitalem functionem: primo pulsus qui pro magna debilitate
3. apparente satis fortis, bene aequa, non vacillans sed exiguus pro huiusmodi viro,
4. sic ut fere credamus vitalia, lascivum cor, arterias et quae illis adhaerent esse
5. in illa conditione unde continuatio vitae sperari potest.
6. Inveni respirationem quam debemus 2^{do} considerare satis commodam pro tam aegroto
7. homine. satis liberam, quam sic cognoscimus quando aer sine sonitu, sine
8. interruptione libere ducatur, teneatur, educatur sic ut non appereat in parte
9. aerifera pulmonis multum haerere quod impediatur. respiratio satis est lenta,
10. imo inter aerem conductum et emissum intercurrit spatium longe maius quam in
11. moribundis vel debilissimis. Est sine strepitu nisi quod, quando materies in
12. pulmone(m) aggregata est, auditur fervor, quem Hippocrates fervens guttur
13. vocat. Tussis non est adeo mala, necessaria ad educandam hanc materiem;
14. calor satis moderatus ad extrema usque sic ut pedes manus tangens
15. deprehenderem aequum calorem. Displicet unum, quamquam maximum, quoad vitalia: situs
16. corporis dum instar machinae deprehendatur projectis cruribus, in
17. dorso decumbens, hoc signum minus favet quoad vitalia, notans debilitatem
18. unam magnam.
19. 66 annos natus, debilis, atrobiliosus, puer crassior, postea malis obnoxius morbis
20. acutis validis quos incidit in tertianam epidemicam, morbus, in
21. hydropam a quo inter 6 septimanas curatus fuit.

Practical lectures, held in the hospital.

First lecture, Sept. 21, 1737.

Old man, 66 years.

If we wish to examine a patient, we should pay attention not only to the symptoms of his present disease, but also to those which point to his previous state of health. First of all we should observe the vital functions. Taking into consideration the extreme visible weakness of this patient, his pulse is pretty strong and equal, though small for such a man, so that we should be inclined to think that the vital forces, the vivid heart, the arteries and what is connected with them, are in a state which gives hope that he will live.

The respiration, which we must observe in the second place, is not so very bad for a man in such a condition; the air is drawn in, held and breathed out again without sound or interruption, from which we may infer that there is not much in the respiratory passages which prevents him from breathing freely. His respiration is rather slow, there is even between inspiration and expiration a much longer pause than we generally notice with very weak or dying people. There is no whistling, but when there is too much mucus in the lung, we hear the rattling noise that Hippocrates called a "boiling larynx". His cough is not a bad sign, on the contrary it is necessary for bringing up the mucus.

The warmth in the peripheral parts is moderate, so that in feeling his hands and feet, I observed the same temperature as elsewhere. There is one thing I am not satisfied with, which is a very important symptom as far as his change of life is concerned: the position of his body; that he lies on his back in such a passive attitude, his legs all relaxed. This symptom is alarming for the prognosis, for it betrays great weakness.

Man of 66 years, weak and bilious; as a boy he was rather fat and afterwards he went through many violent acute diseases; had tertiana epidemica, then dropsy, of which he recovered within 6 weeks.

FACULTY OF MATHEMATICS AND NATURAL SCIENCE BY J. A. VOLLGRAFF.

THE most glorious period in the history of the Netherlands, the seventeenth century, is also a time of triumph for Mathematics and Natural Science. In the beginning of the seventeenth century the study of theoretical Physics, at the universities, was not yet sharply separated from that of Logic, Dialectics and Philology, so that often the same professors taught Philosophy ¹⁾, Physics, Mathematics (and sometimes Medicine). In this period the natural philosophers did no experimental work, but chiefly kept to Aristotelian Physics, as for instance appears from the "*Institutiones physicae*" (1624) by G. Jack (Jacchaeus), a Scotchman, who after being a student at Leyden, became a professor in that University in 1612; also from the "*Collegium physicum*" (1642) by the Leyden professor F. P. Burgersdijk. Physics however (notwithstanding the relapse into scholasticism of men like Burgersdijk) gradually passed from this more or less mediaeval state into experimental Physics, after Professor W. Snel van Royen (1580—1626), Jack's more gifted colleague, following Ptolemy and other Alexandrines, the Arabian scholar Alhazen, etc., had made his optical experiments which led to the well-known law of refraction. Light, according to Snellius as well as Alhazen, is an incorporeal substance, an energy, propagating itself through space. But it was not only in ancient literature that he sought his inspiration; he is also indebted for his methods to some Netherlands contemporaries, like S. Stevin (1548—1620) and some foreign ones, like Tycho Brahé. We may call him the first scientific Geodesist ²⁾,

1) As late as the eighteenth century the Professors's Gravesande and Musschenbroek had to teach Philosophy besides Physics and Mathematics.

2) His triangulation extended from Alkmaar to Bergen-op-Zoom; afterwards it was continued by him as far as Malines.

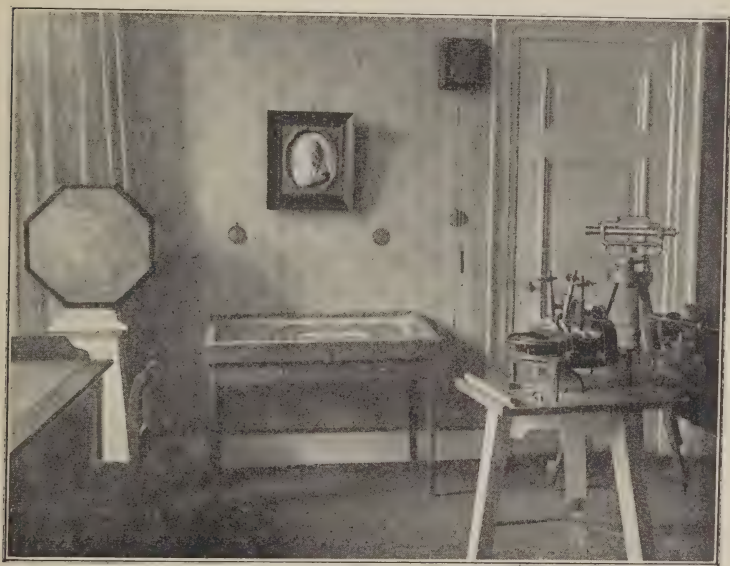
though he had been preceded by Gemma Frisius (1508—1555, both years uncertain) a close observer also in the field of Astronomy. With instruments of his own and with some out of the collection of Prince Maurice of Orange he observed the comet of 1618, the parallax of which he measured. As to Stevin, the military and hydraulic engineer, who invented the sailingcar for his pupil Prince Maurice, Technics and Mathematics in his works go hand in hand. It was he who invented calculation with decimal fractions.

The consequence of the twenty years' residence of Descartes (1596—1650) in the Netherlands was that his works made a deep impression here sooner than elsewhere; through him atomistics came to the front in Physics just as it was doing in other countries. Descartes in his Geometry did not break with the Ancients though he surpassed them; with respect to Physics he tried to emancipate himself from the opinions of the Greeks (Demokritos excepted). In this respect he differs much from Snellius, whom we may in comparison with Descartes call a humanist. Great was the influence of the latter on many Netherlands Professors; at Leyden Fr. van Schooten († 1661), the teacher of Chr. Huygens, was an enthusiastic interpreter not only of Archimedes, Apollonios, etc., as Snellius had been before, but also of Descartes' mathematical methods.

The name of Christiaan Huygens (1629—1695) stands out among those of all other Netherlands Mathematicians and Natural Philosophers of his time; in him Mathematics, Physics, Astronomy and Mechanics are united into a harmonic whole. Though in his later years in many respects differing from Descartes, whom he had known personally, we meet in him until the end of his life with the same striving to explain all phenomena by pressure and impact of small hard particles¹⁾. Probably he would not have been able to discover his famous theory, according to which light is transmitted by

¹⁾ At that time scientists had as yet no idea of the great velocities with which, according to the modern kinetic theory of gases, the molecules of the air move through each other, and of the smallness of the space occupied by these molecules themselves in the midst of the vacuum.

undulations¹⁾, without availing himself of the concrete image of spherical ether-molecules touching one another on all sides. With this creation of an all-pervading²⁾ ether a problem had been thrown into the lists of Physics which gave and still gives rise to endless dispute: that we cannot now-a-days represent the ether to ourselves as Huygens did, may be generally acknowledged, as to the question whether there exists a light-ether at all, opinions remain divided. In the beginning the undulation-theory of Huygens had but little success: rather more than a century afterwards, however, it met with



Chr. Huygens room in the Observatory at Leyden, showing his lenses (made by himself and his brother), his clock and his planetarium.

general agreement, after Fresnel (beginning of the nineteenth century) had worked it into a theory of transversal elastic ether-vibrations, which in its turn was recast into an electromagnetic light-theory by Maxwell (second half of the

1) "Traité de la Lumière", 1690.

2) According to Aristotle the ether exists only above the ordinary atmosphere.

nineteenth century); and of this last it must be said that of late years — now that the opinion is gaining ground that between *mass* and *energy* there is not so fundamental a difference as we used to think in the last century — it shows some inclination to be reconciled to Newton's corpuscular emission theory, which was at first thought to stand diametrically opposed to the doctrine of Huygens. Huygens occupied himself a great deal with the theory of telescopes; a complete edition of his work on this subject (Dioptrics) will be issued this or next year ¹⁾. The construction of the first micrometers (ring and bar-micrometers) is due to him; we may also mention his telescopes of great focal distances, which combined a strong magnifying power with sharpness of outline. By means of these telescopes he recognised the true nature (ring) of the strange appendages of Saturn, already observed by Galileo, and made (in 1659) the first drawings of Mars which have scientific value. He was also the first to apply himself to optical problems (double-refraction) with respect to the minerals quartz and calcite; in Ch. V of the "Traité de la Lumière" he wrote about the molecular structure of crystals: "Il me semble qu'en général les régularités qui se trouvent dans ces productions viennent du rangement des petites particules invisibles et égales dont elles sont composées". Of his further works we mention that on the pendulum clock and centrifugal force ²⁾ and that on the collision theory ³⁾. That Huygens was not only a skilled experimenter, but was also devoted to technical problems, is proved by his construction of clocks and watches and by his gunpowder-engine, which is a precursor of the steam-engine and other motors.

¹⁾ This will be the thirteenth part of the splendid edition of Huygens' works by the Netherlands Scientific Society, an edition in which J. Bosscha has had a great part and which is at present under the direction of Professor D. J. Korteweg.

²⁾ "Horologium Oscillatorium", 1673.

³⁾ "De Motu Corporum ex Percussione", 1703.

MATHEMATICS BY J. CARDINAAL.

SIDE by side with Fr. van Schooten, H. van Heuraet and S. J. Hudde (1628—1704) distinguished themselves in the field of Cartesian Mathematics; like Huygens both of them were only in so far directly connected with the university that they had had their education there. Like them another man, of even greater fame and talents, J. de Witt (Grand Pensionary 1653—1672), a gifted Geometrician, at the same time the first who applied the theory of Probability to life assurance, accepted a post in the Government.

The eighteenth century is a period of working out and continuation rather than creation, yet at this time we meet with Joh. Bernouilli (1667—1748), Professor at Groningen, and W. J. 's Gravesande (1688—1742), Professor at Leyden, as eminent representatives of Mathematics.

With the opening years of the nineteenth century begins a time of new development. The Amsterdam Professor J. H. van Swinden (1746—1823) takes an active part in the introduction of the metric system of weights and measures and writes a book on Geometry in which he opposes the ancient and current Euclidean method. We may note a development of mathematical instruction, appearing from the text-books by J. de Gelder, Professor at Leyden, and J. R. Schmidt, Professor at the Military School at Delft. They were written in behalf of both university and preparatory instruction and also with a view to technical instruction. Schmidt published a translation of L. F. Lacroix's *Descriptive Geometry*. Most probably this is the first work on this subject in the Netherlands; at least H. Strootman, who published a *Descriptive Geometry* in 1841, says that there exists only one Netherlands work on this science and that even this is a translation.

In the next period we notice among the Netherlands

Mathematicians a growing inclination to follow the elegant methods of the French text-books. Several names of eminent men might be mentioned, but we shall confine ourselves to two Netherlands who were known abroad: R. Lobatto, Professor in the Royal Academy at Delft, and D. Bierens de Haan, Professor at Leyden ¹⁾.

If we look at the condition of Mathematics in the Netherlands about 1870, the following things strike us. On the one hand we find the instruction in Mathematics widely extended by the foundation of secondary schools, evening-classes for the middle-classes, technical schools, as well as by the broader view taken of this instruction at the Polytechnic School and Universities; on the other hand much in it is still defective. In the first half of the nineteenth century Geometry developed rapidly in neighbouring countries; at the same time the field of Algebra and Analysis was very much enlarged. During the period we have just now considered, we do not notice many traces of this development in the Netherlands and instruction is very little affected by it indeed.

After 1870 there comes a change and in 1880 many mathematicians apply themselves to the theory of invariants, the function theory, the theory of numbers, modern geometrical methods, complexes and congruences, cinematic methods; we may also notice a great rise in the study of theoretical Mechanics. All this also affected University education, so that of late years the Netherlands may be said to have taken an active part in the development of Mathematics. Of great influence on this development was the Netherlands Mathematical Society at Amsterdam. For many years already this Society had published a periodical and had regularly given the opportunity of solving mathematical problems and prize subjects, but now regularly recurring lectures were held about all branches of Mathematics; under the name of "*Revue Semestrielle des publications mathématiques*" a general survey was given of all mathematical periodicals. With respect to this period we mention the deceased Groningen Professor P. H. Schoute (1846—1913), a talented

¹⁾ Cf. F. Müller's "*Gedenktagebuch*" (Teubner).

representative of Geometry, especially of the Geometry of more dimensions, and Th. J. Stieltjes (1856—1894), famous on account of Analysis, who taught in France. A discussion of the merits of those who are still alive would be out of place. We will be content to mention without further comments the names of those who teach in the Netherlands Universities: at Leyden P. van Geer and J. C. Kluyver; at Utrecht W. Kapteyn and J. de Vries; at Groningen F. Schuh and J. H. Barrau; at Amsterdam D. J. Korteweg, Hendrik de Vries and L. E. J. Brouwer; and at the Technical University at Delft J. Cardinaal, G. Schouten, J. G. Rutgers, W. H. L. Janssen van Raay, W. A. Versluys, and J. A. Schouten.

The principal periodicals published in the Netherlands which accept articles on Mathematics are: "De Verslagen en Verhandelingen der Kon. Akademie van Wetenschappen te Amsterdam", the "Archives Néerlandaises", the "Nieuw Archief voor Wiskunde", the "Wiskundig Tijdschrift", the "Vriend der Wiskunde", and the "Nieuw Tijdschrift voor Wiskunde."

PHYSICS BY J. A. VOLLGRAFF.

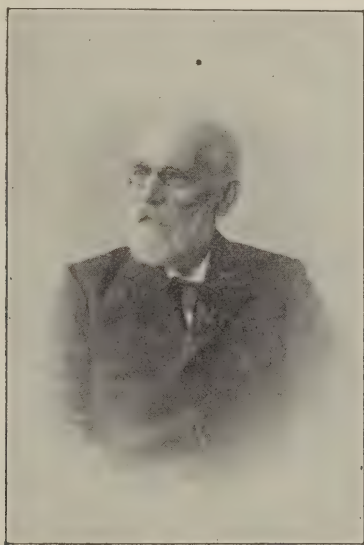
AT the Leyden University experimental investigation took a more systematic character in Huygens' time. In 1674 a laboratory was established there. The air-pumps that were constructed under the direction of the Professors B. de Volder (end of the seventeenth century) and W. Senguerd (beginning of the eighteenth century), were of some renown.

The fact that Huygens (who resided at Paris for a long time) did not occupy a public Chair and did not form any direct pupils, explains that the most famous Netherlands Professors ¹⁾ of Physics in the eighteenth century — W. J. 's Gravesande (1688—1742) and P. van Musschenbroek (1692—1762) — showed themselves, even in the theory of light, dependent on Newton rather than on him. 's Gravesande's teaching, together with that of Boerhaave in Chemistry and Medicine, drew students from all countries; several of the instruments, described in his famous text-book "Physices elementa mathematica", constructed in the workshop of the Musschenbroeks at Leyden, are even now in good condition. Professor P. van Musschenbroek is best known for the invention of the Leyden jar and the construction of the pyrometer, an instrument for measuring expansion by heat. Unlike Musschenbroek, 's Gravesande does not give a foremost place to atomistics, as he refrains as much as possible from hypotheses. In the dispute about the question whether the energy of a moving body is in direct proportion to its velocity (Descartes), or to the square of its velocity (Huygens and Leibniz), 's Gravesande placed himself first on the former standpoint, but his experiments caused him to recognise the truth of the newer doctrine, of

¹⁾ 's Gravesande taught at Leyden, Musschenbroek first at Utrecht, afterwards at Leyden.

which he now became a zealous defender. He did not go so far as Leibniz, who already believed in a universal conservation of energy in nature.

The first half of the eighteenth century is followed by a period of decline: great scientists were wanting until the second half of the nineteenth century, though mention should be made of M. van Marum (1750—1837) at Haarlem, who made many experiments on electric discharges and whose huge electric engine is still the great attraction of the Teyler Museum in that town ¹⁾.



Dr. J. D. van der Waals, born Nov. 23, 1837, formerly Professor of Physics in the University of Amsterdam.

Between 1850 and 1860 J. Bosscha ²⁾ (1831—1911) applied himself to investigations as to the validity of the Law of the Conservation of Energy in electric currents. He wrote

¹⁾ The Teyler Museum contains a beautiful historical collection of physical instruments. The laboratory belonging to this Museum has of late been newly equipped under the direction of Prof. Lorentz.

²⁾ Since 1873 Professor at Delft.

the most extensive text-book on Physics in the Netherlands language (afterwards often revised and still in common use).

The erection of the laboratory for Physics at Leyden in 1880 was an important factor in the national revival of this branch of science. Professor P. L. Rijke was the man who restored experimental Physics to a place of honour at Leyden. In 1873 J. D. van der Waals (born in 1837)¹⁾ took his degree there. His dissertation, entitled: "The continuity of the liquid and gaseous states", followed by



Dr. H. Kamerlingh Onnes, born Sept. 21, 1853, Professor of Physics in the University of Leyden, in his cryogenic Laboratory.

many theoretical investigations connected with this subject, has had a strong influence on the direction of the work performed in the Leyden laboratory. Since Professor H. Kamerlingh Onnes (born in 1853) became Director of this

¹⁾ Since 1877 Professor at Amsterdam.

laboratory (1882), many — also foreign — scientists have experimented there on the transition of gases into liquids. Extreme accuracy of observation is the rule in this laboratory. Great cold being often required for the said transition, this work gradually led to a specialisation with regard to low temperatures (the so-called “cryogenic” laboratory). They are obtained by a cascade-process: methylchloride, ethylene, oxygen, air and hydrogen are liquefied successively. In 1908 Professor Kamerlingh Onnes succeeded in liquefying the last “permanent” gas, helium.

Meanwhile many other experiments, on electro-magnetism, light, etc. were made at Leyden. Well known are the experiments of P. Zeeman (born in 1865)¹⁾, made in 1896, on the decomposition of spectral lines by magnetic fields (the so-called Zeeman effect), which are still being continued at Amsterdam by the discoverer.

The most remarkable discovery that has been made of late years (1914) by Professor Kamerlingh Onnes is that of the supraconductive state, into which several metals are brought by the helium temperatures: their resistivities become so small that induced electric currents can circulate in them for many days.

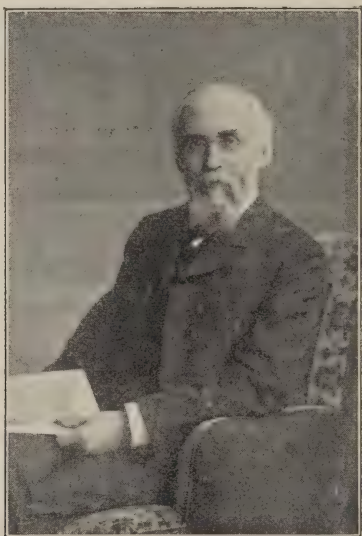
One of the principal objects of Professor van der Waals was and is: to spread the belief in the reality of the small particles composing the material bodies, according to the kinetic theory of matter²⁾. H. A. Lorentz (born in 1853)³⁾ showed himself as great an advocate of this creed (the truth of which may be considered to have been proved only recently). This does not prevent both scientists having an open eye for the advantages of phenomenological methods of investigation, especially for the thermodynamic theories of the profound American thinker W. Gibbs. Professor Lorentz,

1) Since 1900 Professor at Amsterdam.

2) Cf. his Oration on receiving the Nobel prize in 1910: „Nobel-Vortrag vor der Kön. Schwed. Ak. d. Wiss”, Stockholm, 1911. Here it may be also mentioned that Lorentz and Zeeman together acquired the Nobel prize in 1902 and that Kamerlingh Onnes obtained it in 1913. The latter received the Franklin medal in 1915.

3) Since 1878 Professor at Leyden.

who has successfully worked in all branches of modern theoretical Physics ¹⁾, is without doubt one of the most shrewd and most comprehensive minds among the now living Physicists. As a problem which has always particularly occupied him we may mention that of a possible influence of the motion of the earth through space on light and other electromagnetic phenomena on the surface of the earth; with respect to this the experiments of the American scientists Michelson and Morley have always commanded his greatest attention. Whereas the objective reality of a *rotation* of the



Dr. H. A. Lorentz, born July 18, 1853, Professor of Physics
in the University of Leyden.

earth is in itself acceptable, this can perhaps not be said of the objective reality of a *translation* of the earth. The modern views on the relativity of the conceptions of space and time are (if we neglect the influence of Kantian philosophy)

¹⁾ Part of his work appeared as "Abhandlungen über theoretische Physik" I, Leipzig und Berlin, 1907.

for the greater part a consequence of Professor Lorentz's views. He has also much occupied himself with the theory of Electrons¹⁾; the variability of the mass of the small particles when in rapid motion, specially attracted his attention. This variability of the mass of particles emitted by radio-active substances makes it impossible to consider the so-called Classical Mechanics (of Galileo, Newton, Lagrange, and others) as furnishing the most accurate and complete description of natural phenomena: we said before, speaking of Snellius and Huygens, of Fresnel and of Maxwell, that new opinions (or should we say old opinions in a new form?) about mass and energy are beginning to make their way. Professor Lorentz occupies an important place among those who take an active part in the development and sifting of these ideas.

We must further mention that the physical laboratories at present in use at the universities of Utrecht, Amsterdam and Groningen were resp. founded in the years 1876, 1882 and 1892. The Utrecht Professor W. H. Julius applies himself to the physical theory of the sun. At Groningen important investigations have been made by Professor H. Haga and the late C. H. Wind²⁾ on the deflection and polarisation of Röntgen-rays. Prof. Haga and Prof. F. M. Jaeger are engaged in the experimental study of the molecular structure of crystals, by means of Röntgen-rays; by this method, recently discovered in Germany, the existence of the "*petites particules invisibles et égales*," of which Huygens spoke, can be proved.

Besides those about whom we spoke before, we will mention the following Professors, who have all taken part in some of the above-mentioned experimental or theoretical investigations: at Leyden J. C. Kuenen; at Utrecht L. S. Ornstein; at Amsterdam R. Sissingh, J. D. van der Waals Jr., and Ph. Kohnstamm.

1) Cf. "The Theory of Electrons and its application to the phenomena of light and radiant heat", a course of lectures delivered in Columbia University, New York, in 1906. (Leipzig, 1909).

2) Afterwards Professor at Utrecht.

ASTRONOMY BY W. DE SITTER.

IN the sixteenth century there had already been a few private observatories, such as those of Wilhelm IV of Hessen and of Tycho Brahé, which fell into disuse however with the death of the founders. The first official observatories connected with a public body were those of the Universities at Leyden [founded in 1632] and Utrecht [1642] ¹⁾. Yet almost all astronomical work in the Netherlands has been done outside these observatories, which served almost exclusively for instruction.

To the great philologist Joseph Scaliger ²⁾ Astronomy owes the introduction of the Julian period, which is still in use. J. F. Holwarda ³⁾ made the first accurate observations of the variable star Mira Ceti (1639).

After Huygens, about whom we spoke before, nothing astronomical is to be mentioned in the Netherlands for the next century and a half. We need only draw attention to J. Lulofs ⁴⁾ who observed the transits of Mercury in 1743 and 1753 and the transit of Venus in 1761.

The revival of astronomy begins with F. Kaiser ⁵⁾ to whom it is in a great part due, and who by many popular writings succeeded in rousing the interest of the authorities and the public. This led to the erection of the new observatories at Utrecht in 1854 ⁶⁾ and Leyden in 1860. Kaiser's scientific work, besides the fitting up and management of the Leyden observatory and the organisation of the meridian observations, chiefly extended to double-stars and planets.

1) Next came Copenhagen in 1656 and Paris in 1667.

2) 1540—1609; Professor at Leyden 1593.

3) 1618—1651; Professor at Franeker 1639.

4) 1711—1768; Professor at Leyden 1742.

5) 1808—1872; Professor at Leyden 1840.

6) Enlarged and renewed in 1907.

His observations of Mars, from which, by combining them with those of W. Herschel and of Huygens, he deduced its period of rotation, are among the best of that time.

Kaiser was succeeded at Leyden by his pupil H. G. van de Sande Bakhuyzen. The latter devoted himself by preference to problems concerning the fundamental principles of Astronomy. Well known are: his instrument for the determination of personal errors, his investigations on refraction, on the variation of latitude, etc. At the Congresses at Paris of the Committee for the map of the heavens, as permanent Secretary of the International Geodetic Association and in many other functions he was one of the leading personalities in the internationalising of science, which is characteristic of the latter part of the nineteenth century.

In 1908 he was succeeded as Professor of Astronomy by W. de Sitter and as Director of the observatory by E. F. van de Sande Bakhuyzen.

The astronomical chair at Utrecht was successively occupied by Kaiser's pupils M. Hoek (1859—1873) and J. A. C. Oudemans (1876—1898). The former chiefly applied himself to the study of cometary orbits; the latter is especially known for his triangulation of Java. Oudemans was succeeded by A. A. Nijland, who makes his chief study of variable stars.

At Groningen J. C. Kapteyn was appointed as Professor in 1878, and made the study of the fixed stars his life-work. His parallax determinations with the Leyden meridian circle were the first obtained by that method. The photographs on which the Cape Photographic Durchmusterung is based, were measured at Groningen with the parallactic measuring instrument invented by him. In the Astronomical Laboratory, the first institution of that kind ¹⁾, Parallaxes and Proper Motions are determined from photographs made by various observatories according to Kapteyn's methods, and there also the theoretical investigations are carried out which amongst other things led to the discovery in 1902 of the two star-streams. As a Research Associate of

¹⁾ Erected in 1896.

the Solar Observatory on Mount Wilson he is in close touch with American astronomers.



Dr. J. C. Kapteyn, born Jan. 19, 1851, Professor of Astronomy in the University of Groningen.

The data necessary as the basis of a thorough investigation of the constitution of the universe, are enumerated in the "plan of selected areas", drawn up in 1906, in the execution of which Observatories of all nations of both hemispheres are co-operating.

MINERALOGY, GEOLOGY AND RELATED BRANCHES OF SCIENCE BY J. VAN BAREN.

A. CRYSTALLOGRAPHY, MINERALOGY, PETROGRAPHY.

EXCEPT Isaäc Hollandus († 1400), whose "Opera mineralia" appeared about 1600, but are very little known at present, and Chr. Huygens, already mentioned before as investigator of the optical double-refraction, no names of influential scholars in these branches of science in the history of olden times ¹⁾ have been preserved.

In the nineteenth century certain views have been published on the building of calcareous deposits in brackish waters, as for instance the little lake of Rockanje on the island of Oostvoorne; these views are chemical rather than mineralogical ²⁾.

When in 1876 the University Education Act was for the first time enforced, a Chair for the geological sciences was erected in each of the Universities (Leyden, Utrecht and Groningen). The one at Groningen was occupied by F. J. P. van Calker ³⁾ born at Bonn in 1841, deceased at Groningen in 1913; the one at Utrecht by A. Wichmann, born at Hamburg in 1851. Whereas the former made important petrographic investigations into the nature of the Scandinavian boulders, which lie scattered in the North East of the

¹⁾ We pass over here the well-known microscopist and self-made man, A. van Leeuwenhoek (1632—1723).

²⁾ C. H. Bergsma: "Responsio ad questionem: Quaeritur an incrustationes indigenae sint chemicae, an vero alius originis" in the "Annales Academiae Lugduno-Batavae" 1823

P. G. van Anrooy: "Dissertatio chymica inauguralis de incrustatione in lacu Rokaniensi" (Dissertation, Leyden, 1852).

³⁾ A biography with an enumeration of his writings, by H. G. Jonker, was published in the "Jaarverslag van het Geologisch Mijnbouwkundig Genootschap voor Nederland en Koloniën", Amsterdam, 1914.

Netherlands and were brought there by the inland ice, the latter feels himself particularly attracted towards the Petrography of the Indian Archipelago and has published a great number of investigations on this subject.

Another highly talented student of the sciences mentioned under this head, was the early-deceased J. L. C. Schroeder van der Kolk (1865—1905)¹⁾, Professor in the then Polytechnical School (now Technical University) at Delft. Whilst Mineralogy owes to him an ingenious method for determining minerals according to the index of refraction, he enriched Petrography with many interesting studies on the microscopic nature of rocks from the Eastern part of the Indian Archipelago. He likewise published theoretical views on the hardness of minerals in connection with their cleavage, on the "Sympathy" and "Antipathy" of the elements in igneous rocks, etc.

B. GEOLOGY.

More than in the realm of Mineralogy and related sciences, Netherlands have applied themselves to Geology, for which science the extensive colonies especially offered an abundance of investigation material.

Of the years before the beginning of the nineteenth century we will here mention J. Le Franq van Berkhey (1729—1812), who investigated the soil of the Western part of the Netherlands; S. J. Brugmans (1763—1819), who devoted himself to the study of the soil round the town of Groningen; and J. H. Degner (1687—1756), to whom we owe a remarkable writing about the peat-bogs²⁾.

Of far more importance is Winand Carel Hugo Staring

¹⁾ J. Lorie: "Dr. J. L. C. Schroeder van der Kolk en zijn werkzaamheid" in the "Tijdschrift van het Koninklijk Nederl. Aardr. Genootschap", 1905, with a bibliography of his writings.

²⁾ An enumeration of geological Literature with respect to the Netherlands, and running from 1734—1906, was published by H. G. Jonker ("Verh. der Koninkl. Acad. van Wetensch. te Amsterdam", 2nd section, vol. XIII, Amsterdam 1907).

(1808—1877)¹⁾ whom we may truly call the founder of the Geology of the Netherlands. He was the first to give a thorough geological description of the Netherlands soil (1860) and at the same time published an extensive geological map of our country (1867).

Thanks to the initiative of the late Minister of Agriculture, Commerce and Industry, de Marez Oyens, we have since 1903 a Service for the purpose of exploring the Netherlands for useful minerals (especially coals and salts). To its director, van Waterschoot van der Gracht, and his co-operators Huffnagel, Jongmans, Klein and Tesch, we owe many valuable contributions to the knowledge of the geology and palaeontology of the Netherlands²⁾.

His work was, at least to some extent, continued by J. Lorié (born in 1852) to whom we owe a great number of writings on the deeper geology of the Netherlands, on our dunes and peat-bogs; on the diluvium of the rivers Rhine and Scheldt, etc. With regard to our colonies we should make mention of Franz Wilhelm Junghuhn, born at Mansfeld in 1809, deceased at Lembang (Java) in 1864. To him we owe the exceedingly suggestive standard work on the soil and vegetation of Java. Though geologically a self-educated man he understood the art of drawing sceneries of landscape, some parts of which ought to be classed with classical literature. He was a man who in science, according to Gottfried Keller, valued "die hingebende Liebe an alles Gewordene und Bestehende" higher than "das Herausstehlen des Einzelnen"³⁾.

1) J. van Baren wrote a biography in the "Gedenkboek Dr. W. C. H. Staring, gehuldigd op zijn 100^{sten} geboortedag", The Hague, 1908, in which book we also find a bibliography by A. A. van Pelt Lechner.

2) A concise work on our knowledge of the Netherlands was published in 1913 by Molengraaff and van Waterschoot van der Gracht as Number 3, Volume I, of the "Handbuch der regionalen Geologie" by G. Steinmann and O. Wilckens (Heidelberg). A voluminous book with numerous engravings and maps is: J. van Baren, "De bodem van Nederland", 2 vol., Amsterdam, 1908.

3) A biography by M. Schmidt occurs in the "Gedenkboek voor F. Junghuhn", The Hague 1910, which book also contains a bibliography by W. C. Muller.

Among the later investigators we should first of all mention the ex-Director of the Indian Mines, R. D. M. Verbeek, born in 1845, who acquired European fame on account of his unparalleled knowledge of the Geology of the Indian Archipelago. Next to his great work on the volcanic eruption on Krakatau, in the year 1883, science owes to him geological maps and descriptions of parts of Sumatra, Borneo, and the Moluccas, besides, in collaboration with the engineer R. Fennema († 1897), a map with a description of the whole of Java, a work of vast importance ¹⁾.

We also owe geological investigations of great importance to G. Molengraaff, born in 1860, Professor of Geology in the Technical University at Delft, who made great expeditions in Borneo (1894) and Timor (1911). For a long time he was leader of the geological service of the former Transvaal Republic.

The above-mentioned Wichmann, too, has to a great extent filled up the gap in our geological knowledge by his expeditions in the Eastern part of the Indian Archipelago (1889) and especially in New Guinea (1903).

C. PALAEONTOLOGY.

As early as the eighteenth century the wealth of fossil remains which are to be found in limestone strata of the St. Pietersberg near Maastricht led certain Netherlands investigators, such as P. Camper (1722—1789) and his son A. Camper (1753—1820) to apply themselves to the study of this subject. Their communications were founded amongst other things on the large collections which had been formed by two inhabitants of Maastricht: Drouin and Hoffmann; the afore-mentioned collections are still found in the Teyler Museum at Haarlem.

In the beginning of the nineteenth century there were

¹⁾ An enumeration of everything that has been written on the Geology and Mining of Netherlands India, was published by Verbeek in the "Verhandelingen van het Geologisch-Mijnbouwkundig Genootschap voor Nederland en Koloniën", vol I, The Hague, 1914

three Netherlands who made a closer investigation of the fossil fauna of South Limburg, the only one known in those days. They were Jozef de Bosquet, born at Maastricht in 1814 and deceased there in 1880¹⁾; Jean van den Binkhorst²⁾ born in the neighbourhood of Oldenzaal in 1810 and deceased at Maastricht in 1876; and Casimir Ubaghs³⁾, born at Aix-la-Chapelle in 1829 and deceased at Maastricht in 1894. Of these three Palaeontology owes the most important writings to the first; they not only treated the fossils of the Cretaceous formation but also those of the Tertiary strata. It is deeply to be regretted that the greater part of the treasures collected by them have gone to foreign museums. Probably this is the reason why their work was not continued by Netherlands (T. C. Winkler, from 1864—1896 Conservator of the Teyler Museum at Haarlem, supplied a few minor contributions), and why they turned to the rich treasures Netherlands India supplied. Most of the study and investigation of the fossil remains which are to be found in the East Indian Archipelago is due to K. Martin, born at Oldenburg in 1851, the third scientist to whom in 1876 a Chair in the Geological sciences was offered, namely the one at Leyden. The material brought together during his years of travel in the West Indies (1886) and East Indies (1891 and 1910), besides that which had been collected by Junghuhn, Verbeek and others, he described in numerous monographs.

We ought to mention further Eug. Dubois, born at Eysden in 1858, Professor in the University of Amsterdam, who especially applies himself to the study of the fossil mammals and to whom science owes the stirring discovery of the fossil man-ape, the *Pithecantropus erectus*. This discovery was made near the village of Trinil on the

1) Cf. C. Ubagh's "Notice biographique sur J. Bosquet" (Annales de la Société géologique, tome VIII, Liège 1881)

2) Id. "Notice biographique du géologue Binkhorst" (Publ. d. l. Soc. hist. et archéol. dans le Duché de Limbourg, Tome XXIII, Ruremonde 1886).

3) Cf. A. Erens: "Notice biographique sur C. Ubaghs" (Bulletin d. l. Soc. belge de Géologie, Tome IX, Bruxelles 1896).

Solo river in Java; the objects which were found there have given rise to a literature in itself.

Finally we ought to mention the name of Jacob Elisa Doornik ¹⁾, born at Leyden in 1777 and deceased at New Orleans in 1837, who was among the few that cleared the way for Darwinism in the opening years of the nineteenth century and who in 1808, 1816 and 1829 ²⁾ pleaded ardently for the descent of man, in a way which was afterwards further extended and developed by Charles Darwin.

¹⁾ A biography of this remarkable Netherlander, who has been entirely forgotten, was published by J. van Baren in the "Jaarboek voor Geschiedenis en Oudheidkunde van Leiden en Rijnland", 6de Jaargang 1909, together with a bibliography of his writings.

²⁾ Cf. J. E. Doornik: "Observations Concerning Fossil Organic Remains" (American Journal of Science and Arts XV, 1829, p. 90).

BOTANY BY TH. VALETON.

WITH the revival of botanic science during the sixteenth century the Netherlands soon come to the fore. Botany then grew to be a description of plants, in which the art of printing and engraving played an important part. Famous as writers of "Kruydtboeken" (herbals) during this period are: Rembertus Dodonaeus (1517—1585), Carolus Clusius (1526—1609) and Matthias Lobelius (1538—1616). During the two following centuries this at first rather disorderly description of plants developed into the science of phytography or systematic botany. It was in the Netherlands that this reformation took place: Carolus Linnaeus (1707—1778) lived in the Netherlands for three years (1735—1738) and here he wrote his most interesting pioneer writings (including "Systema Naturae" and "Genera plantarum"). The name of Clifford, burgomaster of Amsterdam, whose hospitality he enjoyed during that time at the former's country-seat "de Hartenkamp" near Haarlem, was immortalised by Linnaeus in the splendid work "Hortus Cliffortianus".

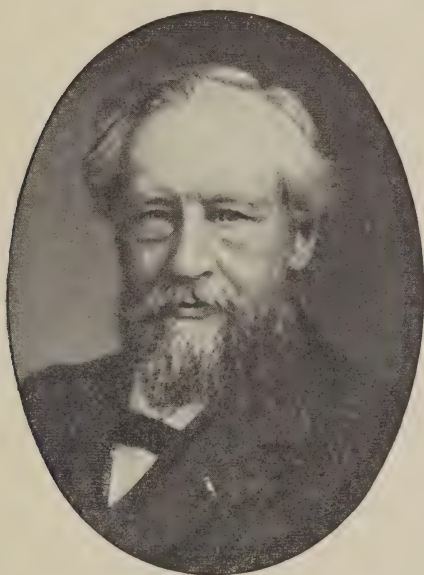
Two factors contributed to make descriptive botany attain such a height in this period, viz. the enthusiasm for the foundation of botanic gardens, where indigenous and exotic plants are grown, by private persons as well as by universities, and the introduction of plants from — and scientific travels in — the Netherlands colonies through the medium and under the auspices of commercial magnates. The botanic garden at Leyden, the fourth in the series in Europe (Padua, Pisa and Bologna preceded), established in 1587, was soon the most celebrated of all. A long list of illustrious names is attached to this garden, the most famous among which are Clusius and Boerhaave, whose world-wide fame drew Linnaeus to the Netherlands. Among the Botanists in transmarine regions we must mention: Paul Herman ("Collected

travels from 1672—1680", "Museum zeylanicum", 1717), Rheed van Draakenstein ("Hortus Malabaricus", Amst. 1678—1703), J. Burmannus ("Thesaurus zeylanicus", Amsterdam 1737), L. Burmannus ("Flora indica", Leyden, 1768), N. J. Jacquin ("Enum. Syst.", Leyden 1762) and many other works), Thunberg ("Flora Japonica", 1784) and above all the unequalled Rumph ("Herbarium Ambonense", Amst. 1741—1755).

In the beginning of the nineteenth century an event took place of far-reaching significance, viz. the establishment of the Botanical Garden ('s Lands Plantentuin) at Buitenzorg (Java) in 1817 (Reinwardt, Professor at Leyden, was the first Director, after him Blume, Scheffer and Treub), to which in 1845 the Herbarium was added, founded by the great Teysmann. Some time before (1828) the Government Herbarium had been erected at Brussels by Blume; it was soon afterwards removed to Leyden. Here the botanical treasures of the Archipelago were collected and even now, by the side of the sister institution at Buitenzorg, it forms the centre for the study of the Malay flora. Moreover, a large number of splendid works and detailed descriptions concerning this flora have appeared since the beginning of the last century. We may mention the names of Blume, Korthals, de Vriese, Junghuhn, Zollinger, Suringar, Boerlage, the transactions in "Mededeelingen en Bulletin van 's Lands Plantentuin", the "Icones Bogorienses", "De Flora van Buitenzorg", and "Nova-Guinea" (Wichmann). A first attempt at bringing about a collective work, was made by the Utrecht Professor F. A. W. Miquel, Director of the Government Herbarium ("Flora Indiae Batavae", 1859—'63). There is a continual increase of materials from the gradually more intensively explored colonies; those already collected (of which we should specially mention the enormous collections by Teysman in the Archipelago and by Koorders chiefly in Java) are not yet entirely worked out. The scant number of fellow-labourers have their hands still so full with the details, that we cannot expect that a more complete comprehensive work should soon be issued. Of late years, next to Leyden and Buitenzorg, a centre for systematic botany has also been

formed at Utrecht, where up to the present moment amongst other things the study of the West Indian flora has been successfully taken up. A flora of Borneo is in preparation at Leyden.

By the side of systematic Botany, the other branches of Botanic science too may boast eminent students in the Netherlands. Even among the first pioneers in Microscopic Botany we find A. van Leeuwenhoek ("Opera omnia", Leyden 1715—1722); in the nineteenth century Paul Harting



Dr. H. de Vries, born Feb. 16, 1848, Professor of Botany
in the University of Amsterdam.

was a microscopist of European fame; with regard to Physiology we should mention among the older scientists (eighteenth century) Paets van Troostwijk, Barneveld, van Marum, and Brugmans, in the nineteenth Rauwenhof and Hugo de Vries, whilst the name of Melchior Treub is connected with numerous shrewdly conceived and artistically carried out investigations in the department of Morphology,

Embryology and Physiology ("Verh. Ak. v. Wet. Amst." and "Ann. du Jardin Bot de Buitenzorg").

We should finally mention that Treub not only by his own investigations, but even more by what he did for science by erecting the laboratory for foreign scientists at Buitenzorg founded for himself a monumentum aere perennius, and that the ingenious ideas and untiring investigations still in progress of Hugo de Vries respecting the descent theory and heredity ("Mutations-theorie", 1901—1903), have created new points of view and fresh sources of knowledge.

ZOOLOGY BY A. SCHIERBEEK.

IN the middle of the seventeenth century there lived in the Netherlands the great naturalists Johannes Swammerdam (1637—1680) and Antony van Leeuwenhoek (1632—1723). They were the leading Zoologists of their time, though both were automaths. The former chiefly applied himself to the Insects and the Mollusca and was one of the first who occupied himself with fecundation experiments. Through these he became a convinced ovulist. His principal work: "Bijbel der nature" (Bible of nature), Leyden 1737, was edited by Boerhaave and is illustrated by many accurate and artistic engravings. The latter, at first destined to be a merchant, amused himself with making systems of lenses with strong magnifying power and in this way constructed one of the first microscopes. With this instrument he discovered the Protozoa, the Bacteria, the cross-striation of the muscles, etc.

These discoveries gave rise to much discussion on the generatio spontanea. It was under his direction that Van Ham found the Spermatozoids in 1677, and this gave van Leeuwenhoek occasion to construct the theory of animalculism. Besides these, many other naturalists upheld the Dutch name, as for instance F. Ruysch (1638—1731), known for his methods of injection and the discovery of the valvules in the lymph vessels; Antonius de Heyde (about 1675), the discoverer of the ciliary motion; and Reinier de Graaf (1641—1673) after whom the enveloping case of the mammalian egg is called: the Graafian follicle.

In the eighteenth century many foreigners came to the Netherlands who, profiting by the large collections and the good opportunity for study, here made their great discoveries, increasing at the same time the fame of the country that offered them hospitality. Among these should be mentioned:

A. Trembley, who here made his well-known experiments with fresh-water-polyps (1744); P. S. Pallas (1741—1811), who studied at Leyden and among other things described the menagerie of the Prince of Orange; and especially Carl von Linné (1707—1778). This great Swede took his degree at Harderwijk in 1735 and afterwards published many of his classic works at Leyden and Amsterdam. But the Netherlands themselves also spread the name of their country far across its boundaries. Thus did Lyonet (1707—1789) whose monograph on *Cossus* caused a great sensation. The name of Peter Camper (1722—1789) of whom Goethe said that he was “ein Meteor von Geist, Wissenschaft, Talent und Tätigkeit”, is especially remembered for his investigations on the facial angle. With his “d’Amboinsche Rariteitkamer” (cabinet of Amboina curiosities, 1741), G. E. Rumphius carried on the tradition which had been so well started by Volcher Coiter (1535—1600). He also published excellent illustrated works, in which Sepp followed him with the work on the Netherlands Insects (Butterflies), 1762, which has been continued up to the present day. Much later Schlegel published large illustrated works on the birds of the Netherlands and its East Indies (1860).

In the nineteenth century therefore the students of Zoology found the ground well-prepared, especially so because private persons as well as societies and institutions founded large museums, the principal of which are: The *Teyler Museum* at Haarlem (1778), the Royal Zoological Society: *Natura Artis Magistra* at Amsterdam (1838) and the *Rijksmuseum voor Natuurlijke Historie* (Museum of Natural History) at Leyden. Many periodicals were published which accepted zoological treatises, such as: “Verhandelungen van de Hollandsche Maatschappij van Wetenschappen” (the Transactions of the Netherlands Scientific Society, 1752) — afterwards: “Verhandelingen van de Koninklijke Academie van Wetenschappen” (the Transactions of the Royal Academy of Sciences, 1851) — “Tijdschrift voor Entomologie”, 1858, “Tijdschrift der Nederlandsche Dierkundige Vereeniging” (Periodical of the Netherlands Zoological Society, 1875), “Notes from the Leyden Museum” 1879, “Archives du

Musée Teyler", 1883, and for the Colonies "Natuurkundig Tijdschrift voor Nederlandsch-Indië" (Periodical of Natural History for Netherlands India, 1874).

The Netherlands Zoologists applied themselves to several branches of science. In the middle of the nineteenth century appeared the large faunistic work by A. Herklots (1853—'66) and the very extensive manual on the entire subject of Zoology by P. Harting (1862—'74). At that time the famous German naturalists E. Selenka and W. Engelmann were working in this country, both as Professors in the Netherlands Universities.

Paleontology numbered among its students T. C. Winkler, C. Ubaghs and Eug. Dubois, the latter being widely known by his discovery of the *Pithecanthropus*. Embryology, which was always diligently studied in the Netherlands, finds some of its leaders here: A. A. W. Hubrecht and J. W. van Wyhe. Among the Ornithologists H. Albarda and J. P. Thyse are authorities. The science of Entomology, which can boast such a glorious past in our country, is still diligently studied by, amongst others, J. F. van Bemmelen, Ed. Everts, J. Th. Oudemans, M. C. Piepers, and E. Wassmann and likewise by J. C. H. de Meyere and J. Ritzema Bos, which latter also in many ways try to make the scientific results conducive to practical uses. The investigation of the sea is chiefly in the hands of the *Zoological Station* of the Zoological Society at Den Helder (1875), many transactions of which were published by P. J. van Breemen, H. C. Delsman, P. P. C. Hoek (Sub-Director), H. C. Redeke (Director), J. J. Tesch, and others. Other zoologists too studied the sea, with which the country's national existence has been connected for centuries; the Siboga expedition (1899—1900) under the direction of Max Weber, is a brilliant evidence of the energy and of the scientific mind of the Netherlands people. The lower animals are especially studied by J. E. W. Ihle, J. G. de Man, H. F. Nierstrasz, P. H. Sluiter and G. C. J. Vosmaer; the Vertebrata by J. Boeke, L. Bolk, F. A. Jentink, R. Horst and Max Weber.

CHEMISTRY BY W. P. JORISSEN.

ISAAC HOLLANDUS and Jan Isaacs Hollandus may be considered the oldest students of chemistry and alchemy that are known in the Netherlands; the latter lived about 1440. Their works were printed and reprinted between 1600 and 1746, especially abroad. These dates give an idea of the great importance that was attached to their experiments.

Of the Netherlanders who studied chemistry after them, but before the time when in our country this science was taught in a university, we may mention Cornelis Jacobsz, Drebbel (1572—1634) and Hermannus Follinus (about 1590 — about 1650)¹⁾, whilst at the time when the iatro-chemist Franciscus de le Boe Sylvius (1614 - 1672) gave his lectures in the Leyden University, Goossen van Vreeswijk (1626— about 1690) made his experiments with regard to mineral chemistry²⁾. Drebbel probably already knew the fulminates (including fulminate of mercury) and had used them in the sea-mines, constructed by him in 1628.

The establishment of the Universities in the Netherlands (Leyden 1575, Utrecht 1636, Harderwijk 1648, etc.) and of some "illustre scholen" [illustrious schools] (Deventer 1630, Amsterdam 1632, etc.) was followed about 1660 by that of regular lectures in chemistry: among others by the above-mentioned Sylvius, who became Prof. med. pract. at Leyden in 1658¹⁾, but by the side of whom C. Marggraf (1626—1687) gave private lessons in chemistry.

The first chemical university laboratory in this country was established at Leyden in 1670 for the Lecturer Carel de Maets. Well known is also the laboratory of the Lecturer

1) "Chemisch Weekblad" 1914, 822.

2) "Chemisch Weekblad" 1914, 1075; 1915, 28.

J. C. Barchusen (1666—1723), fitted out at Utrecht (about 1698). About the same time (1696) chemistry was for the first time taught at Groningen by R. Eyssonius (1655—1705).

It is well known how highly people thought of Herman Boerhaave's (1668—1738) teaching in medicine and in chemistry also.

His "Elementa chemiae" were universally known and have exercised great influence here and abroad. In the laboratory of his successor H. D. Gaubius (1704—1780) qualitative and quantitative experiments were made, also by undergraduates, while several chemical dissertations date from the time when J. D. Hahn (1729—1784) was Professor at Utrecht. At Groningen the study of chemistry was led into good tracks by P. Driessen (1753—1828) ²⁾. S. Stratingh Ezn. (1785—1841), his successor, also made a name for himself.

At Amsterdam, where chemistry made its first appearance at the Athenaeum in 1775 ³⁾, there worked the well known society of the "Netherlands chemists" (A. Paets van Troostwijk, J. R. Deiman) ⁴⁾, after whom the ethylenebromide is still called the "oil of the Netherlands chemists".

A second flourishing period for chemistry in the Netherlands is that which was introduced by G. J. Mulder (1802—1880) who, at first Lecturer at Rotterdam and from 1840—1867 Professor at Utrecht, must be considered the founder of chemical instruction in this country. Of the scientific investigations which he made, besides a great number of practical ones, those on the albuminoids have become most generally known. Two of his pupils, P. J. van Kerekhoff (1813—1876), Professor at Groningen, and Ed. Mulder (born in 1832) succeeded him. Another pupil, J. W. Gunning

1) For the Leyden chemists cf.: W. P. Jorissen, "Het chemisch laboratorium te Leyden, etc.", 1909.

2) cf.: F. M. Jaeger, "De ontwikkelingsgeschiedenis van het chem. onderwijs aan de Groningsche Universiteit", 1912.

3) For the study of chemistry at Amsterdam from 1785 till 1895, cf. W. P. Jorissen and L. Th. Reicher: "J. H. van 't Hoff's Amsterdamer Periode", 1912.

4) H. P. M. van der Horn van den Bos, "Chemisch Weekblad" 1909, 1.

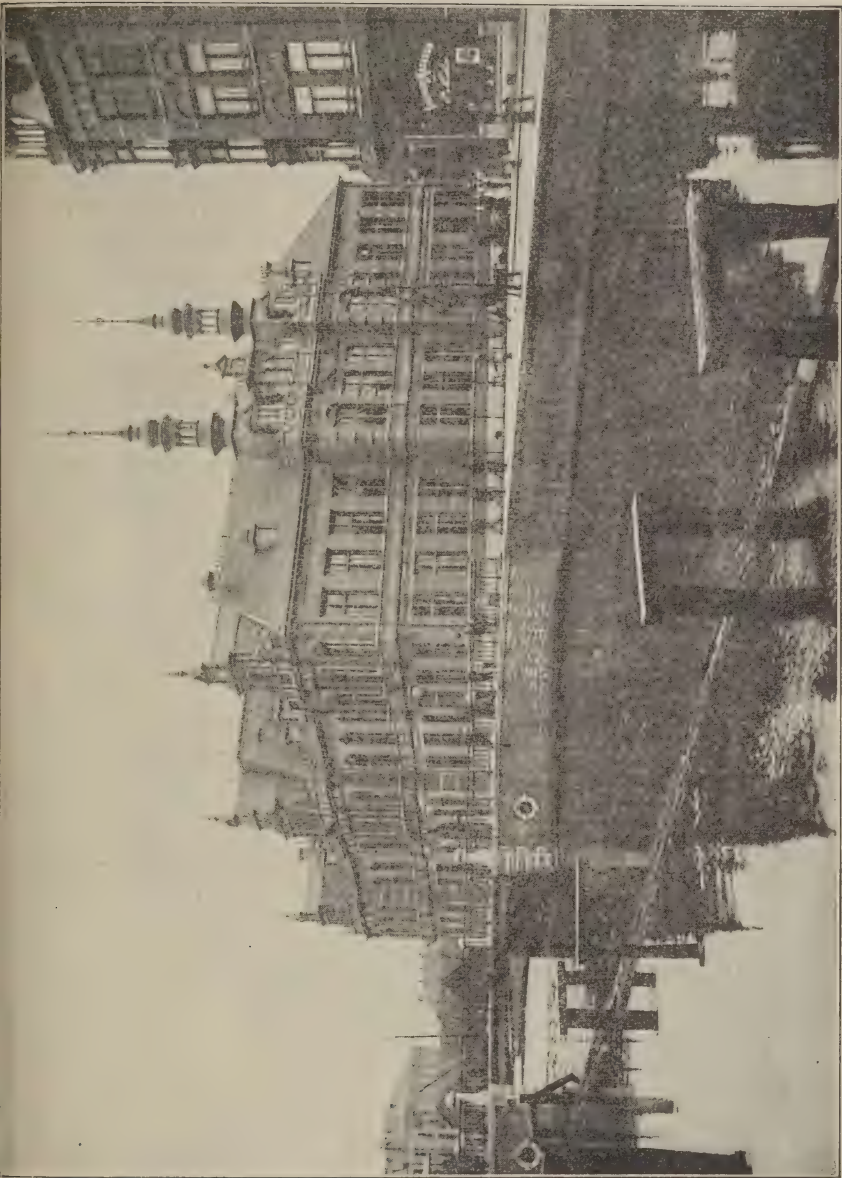
(1827—1900), from 1865 Professor at Amsterdam as successor of Mulder's pupil E. H. von Baumhauer (1820—1885), brought about the appointment (in 1877) of J. H. van 't Hoff (1852—1911) in the newly-erected University of Amsterdam. The latter's theoretical and experimental investigations introduced a new period in chemistry¹). We only mention his theory of the "asymmetrical atom of carbon", his studies regarding chemical dynamics and his solution theory. His



Dr. J van 't Hoff, born Aug. 30, 1852, deceased March 1, 1911, Professor of Chemistry in the University of Amsterdam (1878—1895) and in the University of Berlin (1896—1911).

best known pupil, Ernst Cohen, Professor at Utrecht, is working in a department of chemistry connected with that of his teacher (allotropy, influence of pressure on chemical equilibrium, etc.).

¹) Cf. Note 3 on the preceding page.



Van 't Hoff's Chemical Laboratory at Amsterdam.

Some years before van 't Hoff's arrival at Amsterdam, J. M. van Bemmelen (1830 – 1911) and A. P. N. Franchimont (born in 1844)¹⁾ were appointed Professors of chemistry in the Leyden University. The former has been one of the founders of colloid chemistry²⁾, the latter has raised the study of organic chemistry in the Netherlands to a considerable height. Specially known are his experiments on the nitramines. A pupil of van Bemmelen, H. W. Bakhuis Roozeboom (1854—1907)³⁾ applied Gibbs' phase rule to the heterogeneous chemical equilibria, on which subject at the present time several of his pupils, F. A. H. Schreinemakers (Professor at Leyden), A. Smits (Professor at Amsterdam), and W. Reinders (Professor at Delft) are still engaged with success. Of Franchimont's numerous pupils C. A. Lobry de Bruyn (1857—1904) was Professor at Amsterdam from 1896 until his death. His experiments, especially those concerning the sugars, are well known. Another pupil of Franchimont, A. F. Holleman, Professor at Groningen from 1893—1905, became Lobry de Bruyn's successor at Amsterdam. His principal work belongs to the subject of the substitution products of benzene. Finally, two other pupils of Franchimont, P. van Romburgh and F. M. Jaeger, have been since 1903 and 1909 resp., Professor at Utrecht and at Groningen resp. Whereas the former devotes himself exclusively to organic chemistry, the latter extended his investigations also to crystallography and at present chiefly applies himself to physico-chemical investigations in the domain of high temperatures. A pupil of Hoogewerff (cf. *infra*), J. Böeseken, Professor at the Technical University at Delft, is especially known for his work in connection with the Friedel-Crafts-synthesis; a pupil of Lobry de Bruyn, J. J. Blanksma, succeeded Franchimont at Leyden in 1914. Again, mention should be made of J. F. Eykman, Professor at Groningen, who has made extensive investigations in refracto-chemistry,

1) "Chemisch Weekblad" 1914, 382, 434, 436.

2) Cf.: "Gedenkboek aangeboden aan J. M. van Bemmelen", 1910.

3) W. P. Jorissen and W. E. Ringer, "Mannen van beteekenis", 1907

and of S. Hoogewerff, until 1907 Professor at Delft, who in collaboration with W. A. van Dorp (1848—1914) has done thorough organo-chemical work. With regard to analytic chemistry we should mention Professor N. Schoorl of Utrecht; at Delft this science is taught by Professor H. ter Meulen

We must refrain from including the work of some Lecturers, and of a number of other investigators, owing to pressure of space.

CAROLUS GABRIEL COBET



LITT. HUM. DOCT. IN ACAD. LUGD. BAT. LITT. GRAEC. PROFESSOR
1846-1884. NATUS LUTET. PARIS. 26 NOV. 1819. OBIT LUGD. BAT. 25 OCT. 1889

CLASSICAL LITERATURE BY P. C. MOLHUYSEN.

THE literature taught in the universities of the Northern Netherlands was at first chiefly that of the classical languages. The necessary attention was of course given to Hebrew, with a view to the future theologians, and not long afterwards Oriental literature was given a Chair of its own. With respect to Arabic, a large number of eminent scholars may be pointed to who taught at Leyden. The splendid collection of Oriental manuscripts of the Leyden University Library was naturally not without influence on the study of this language.

Not until 1797 was a Chair founded for the Netherlands language; in the three "modern languages" — French, German and English — instruction is given by professors at Groningen and Amsterdam and by lecturers at Leyden and Utrecht, but there is no doctorate in these languages in the Netherlands.

The study of the classical languages flourished especially at Leyden, and it is a very remarkable fact in the history of science that the Netherlands, which before the foundation of the first university was of no importance in this respect, soon took the lead and occupied a foremost place during nearly one and a half centuries. It is only at Leyden that there is question of philological "schools." The study of Latin especially flourished there: criticism and exegesis attracted the attention of most people, besides the study of Antiquities, of which the huge Thesauri of the 17th and 18th centuries give proof. But one should bear in mind that the specialization of the branches of learning did not take place until the 19th century, and that before that time our scholars rarely confined themselves to one subject only. How many philologists have there been, for instance, who have not shone forth also in the field of theology!

Leyden owes its prominent position in the first place to the two coryphaei who taught there in the first twenty-five years after the erection of its university: to the two of the "triumvirat littéraire," as NISARD so correctly termed it, to LIPSIUS and SCALIGER, who there found the peaceful surroundings which they most needed for their studies.

JUSTUS LIPSIUS (1547—1606), a Belgian by birth and at first professor at Jena, was secured for Leyden by JANUS DOUSA in 1578. His name at once attracted many students, and he has had much influence on the development of that university. His great merits lie in his critical talents, to which we owe a good many publications, especially of Latin prose writers, such as Tacitus, Plinius, Velleius, Suetonius, and in his conscientious study of Antiquities. We may mention here: "de Gladiatoribus" and "de Militia Romana". Of his philosophical works "de Constantia" lived to see almost a hundred editions. Famous too are his "Antiquae" and "Variae Lectiones."

LIPSIUS's public return to the Roman Catholic Church, which he had never wholly forsaken, and his flight to Louvain (1591), was a blow to the Leyden University that might have become mortal. But things took another turn. It was only with much difficulty and great sacrifices that the Curators of the University succeeded in persuading the famous JOSEPHUS JUSTUS SCALIGER (1540—1609) to take the place of LIPSIUS, at first for the period of one year. But once at Leyden, he remained there until his death; there he found the peacefulness for his studies which his own country, tortured by civil wars, could not offer him.

SCALIGER's position at Leyden was a very uncommon one. Paid a high salary, without any obligation to teach, honoured as a prince, his mere presence made of Leyden a centre to which scholars and students came flocking from all parts of the world. Thoroughly acquainted with classical antiquity and classical languages, a sharp critic and man of refined culture, he stands high above his contemporaries. For a long time the Leyden University and the philological school were affected by his influence, much more than by that of LIPSIUS. Next to his editions of Latin authors: Ausonius, Festus and



J. J. SCALIGER (born Aug. 4, 1540, deceased Jan. 21, 1609),
 Professor of Classical Literature at the University of Leyden.
 From an original etching by GOLTZIUS.

Manilius, we may here mention his two principal works in the field of chronology: "de Emendatione Temporum," written in France, and the "Thesaurus Temporum," published three years before his death, a pioneering work in which he tries to give a reconstruction of the "Chronica" by Eusebius, whose validity was to be proved only two centuries later, when new manuscripts were found. He is fully entitled to the name of creator of historical criticism.

By the side of these men we find at Leyden: the Greek scholar BONAVENTURA VULCANIUS (1538—1614), a versatile linguist, who published text-editions and translations of many Greek writers, Byzantine ones among them, and amongst other things edited the older Lexicographers; the historian PAULLUS MERULA (1558—1607), the editor of the Ennius-fragments, whose genuineness has long been wrongly doubted; and DOMINICUS BAUDIUS (1561—1613), a Frenchman by birth.

Already during the lifetime of VULCANIUS, who was blind in his old age, DANIEL HEINSIUS (1580/1—1655), SCALIGER's favourite pupil, was charged with part of the former's lessons. After the death of VULCANIUS he took the latter's place entirely, and so taught Greek at Leyden for about half a century. He was in his time of European fame; though today opinion regarding his critical talents is not so favourable as it used to be, he certainly does not deserve the censure passed on him by LUCIAN MÜLLER. His work comprises the whole of antiquity, and his editions of classical authors are numberless: that of Aristotle's "Poetica" especially made him famous far outside this country. His son NICOLAAS (1610—1681), who far surpassed his father and was an exquisite Latin poet and founder of text-criticism of many Latin poets (*sospitator poetarum latinorum*), never held a post in the university.

In JANUS MEURSIUS (1579—1639) we meet with one of those writers to whose incredible productiveness full justice would no longer be done, now that the original sources are easily accessible to everybody, but who in earlier years succeeded by their great zeal in collecting the material of which succeeding generations for a long time also had the benefit. Greek Antiquities especially attracted him. A complete

edition of his collected works appeared at Florence in the course of the 18th century (ed. LAMI).

MEURSIUS, having become a professor in 1610, went to Denmark in 1625, where he taught at the University of Sorö until his death (1639).

Latin grammar found an eminent scholar in GERARDUS JOANNES VOSSIUS (1577—1649), a polyhistorian such as there are but few; for many years his manual was used in schools; it was even printed at Halle as late as the 18th century. We should further mention here his “*de Vitiis Sermonis*” (Anti-barbarus). His literary histories, “*de Historicis Graecis*” and “*de Historicis Latinis*”, were also used for many years; this latter work was even reprinted at Leipzig in 1833. VOSSIUS, who since 1615 had been a regent of the theological “*hospitium*” at Leiden, the so-called “*Staten-College*”, had to resign his post in 1619, at the time of the disputes between the Remonstrants and Contra-Remonstrants. Having been appointed as Professor *logices* in 1622, he taught at Leyden until 1631 and then became a teacher at the Athenaeum illustre, that had only just been erected at Amsterdam and to whose name he added lustre for another 17 years. His son ISAAC, ambassador to the learned Queen CHRISTINA of Sweden, is especially known for his beautiful collection of manuscripts, the “*Codices Vossiani*”, at present in the Leyden Library. Like NIC. HEINSIUS, he did not hold a post in the University.

In the same year that G. J. VOSSIUS left Leyden, the Frenchman CLAUDIUS SALMASIUS (CLAUDE SAUMAISE, 1588—1653) was appointed a professor on the same conditions as SCALIGER 40 years before; he was a man of genius, but extremely vain, and was not popular in the Netherlands. His continual disputes with his colleagues, especially with DAN. HEINSIUS, did not tend to render his residence at Leyden more agreeable and had a bad effect on instruction. In 1650 he too went to Sweden, to the court of CHRISTINA, where the disputes were continued with the scholars whom he found there, amongst others with IS. VOSSIUS. His presence has not been of much influence on the development of philology in this country.

Another illustrious period was introduced by J. F. GRONOVIVS (1611—1671) who, after having been a teacher at the Athenaeum of Deventer from 1641, was appointed at Leyden. Though a teacher of Greek, his favourite subject was Latin; he was one of the greatest latinists of his time, having the whole field of literature from Plautus to the Ecclesiastics at his command. The prose writers stood first in his favour: Gellius, Livy, Seneca, and Tacitus, to mention but a few edited by him, are still of value. They are text-editions with explanatory notes and corrections; but the explanation is the principal thing to him. Of his treatises on antiquities we will here only mention his “*de Sestertiis*”.

His friend and pupil, J. G. GRAEVIUS, succeeded him at Deventer and went to Utrecht in 1662, where he worked for 40 years with good results. By preference he too treated the Latin prose writers; besides being the editor of many Ciceronian works, he is especially known for his publication of three immense Thesauri: “*Eruditionis scholasticæ*”, “*Antiquitatum Romanarum*” (12 folio-volumes), and “*Antiquitatum et Historiarum Italiæ*” (9 folio. vol.s). However, he was not a great critic.

At Leyden GRONOVIVS was succeeded by TH. RYCKIVS, the editor of Tacitus c. notis. JACOBUS GRONOVIVS, the son of the great J. F. GRONOVIVS, became his colleague in 1679. The name the latter has left behind is entirely different from that of his father; the greater part of his numerous publications have been forgotten; only his “*Thesaurus Antiquitatum Graecarum*”, in 13 folio-volumes, has done good service as a collectanea. Other pupils from the school of GRONOVIVS are PETRUS FRANCIUS, who taught Greek in the Amsterdam Athenaeum, and JAC. PERIZONIUS, at first Professor at Franeker, and from 1695 at Leyden. His Aelianus edition, though too extensive, is not bad, whereas his “*Animadversiones historicae*” may be called a masterpiece of historical criticism. Before his death GRAEVIUS had obtained a colleague in his pupil PETRUS BURMAN (1668—1741), who went to Leyden in 1715. His influence on the study of classical literature in this country has been extensive: the Latin authors that he edited are innumerable. They are the so-called “*editiones cum notis*”

variorum" with tedious introductions, conglomerations without any critical sifting of almost everything that could be brought together from older commentators. For a long time this sort of edition has been the fashion. His pupils TORRENIUS, SNAKENBURG, VAN STAVEREN, the younger BURMAN, etc., each in their special branch of learning continued the work of their master. Compared to the excellent work of SCALIGER and GRONOVIIUS, BURMAN's school is decidedly a step backwards. We must acknowledge, however, that they have in a high degree promoted the study of Latin in the Universities, Athenaea and Latin schools.

With respect to Greek, we find a great scholar in the Franeker professor LAMBERT BOS (1670—1717), the editor of "Thomas Magister." The edition of "Thucydides" by C. A. DUKER (1670—1752), is also well known; DUKER became Professor at Utrecht in 1713. His "Florus" and his work on the Latininity of the Roman jurists, had several reprints; his collectanea on Aristophanes, Suetonius and others, were used by later writers for their own editions of these Greek authors. That on Livy was used in this way in the edition of that historian which was published in 7 quartos by ARNOLD DRAKENBORCH (1684 - 1748), Professor at Utrecht from 1716.

It was not a very happy choice when they made the theologian SIG. HAVERCAMP (1684—1742) Professor at Leyden. It seems that it must be attributed to BURMAN's influence that he and not HEMSTERHUYNS was appointed. His edition of Lucretius has been a failure in every respect. On the other hand, the appointment of FRANS VAN OUDENDORP does credit to the Leyden University. His "Lucanus c. notis variorum" is a good edition, just as the Frontinus, Caesar, Suetonius and Apuleius. Even in the first half of the 19th century his works were still being published in Germany.

A nephew of the above-mentioned BURMAN was PETRUS BURMANNUS SECUNDUS (1714—1778), a voluminous writer, professor at Franeker and from 1742 at Amsterdam. He was highly praised as a teacher. Of his works we should here mention his "Propertius", published as a posthumous work by VAN SANTEN, the "Rhetorica ad Herennium", which had several reprints, "de Inventione" and especially his Latin Anthology.

If up to this time the attention of our philologists had been given especially to Latin, with TIB. HEMSTERHUYS, the talented pupil of PERIZONIUS, there begins a revival of the study of Greek and a new period of glory for classical literature in this country, which culminates in the triumvirate: HEMSTERHUYS, VALCKENAER, and RUHNKENIUS.

HEMSTERHUYS (1685—1766) was successively professor at Amsterdam, Harderwijk, Franeker and, after 1740, at Leiden. He completed the "Pollux" at an early age, that had been begun by LEDERLIN, just as the "Lucanus", with which he himself had made a commencement, was finished by J. F. REITZ. Other authors, Aristophanes, Xenophon Ephesius, Hesychius, Callimachus, also owe a great deal to him. In the "Elogium" RUHNKENIUS represents his master to us as the perfect critic, whose mind went beyond the narrow bounds of one single branch of learning, who thought the study of history and mathematics necessary for the true philologist and for whom Greek was the gate to all further studies. Like SCALIGER before him, he thought the study of Latin impossible without that of Greek, and his great merits lie in the fact that he knew how to make this opinion popular.

And once more Leyden became a centre for the study of philology. From the school of HEMSTERHUYS proceeded PETRUS WESSELIUS, Professor at Franeker, the learned editor of Diodorus and Herodotus; J. PH. d'ORVILLE, Professor at Amsterdam, who together with BURMAN edited the well-known "Miscellaneae Observationes criticae"; and JOH. SCHRADER, Professor at Franeker, the editor of Musaeus, but still better known as an excellent teacher. We have already mentioned his pupils VALCKENAER and RUHNKENIUS.

L. C. VALCKENAER (1715—1785) succeeded HEMSTERHUYS, first at Franeker, and then at Leyden. His principal work is the edition of the "Phoenissae" and "Hippolytus" of Euripides and of "Theocritus, Bion and Moschus." He is a man who worked hard all through life and to whom his pupils owe a good deal of knowledge, an excellent teacher, but certainly the least important of the learned triumvirate.

DAVID RUHNKENIUS (1723—1798) hailing from Stolp in Pomerania, who came to the Netherlands attracted by the

fame of HEMSTERHUY'S erudition, is of much more importance. After a long residence at Leyden and a shorter one at Paris, where he conversed with English and French philologists, he returned to Leyden in 1757, to take the place of OUDENDORP in 1761. He was then already known all over the world by his "Timaeus." During his stay at Leyden he wrote the dissertation on Longinus, the edition of the Homeric Hymnus in Cererem (the only manuscript that was known of this, he had bought for the Leyden Library from MATTHAEI, who pretended to have found it among a heap of rubbish in a stable at Moscow, whereas he had stolen it, as GEBHARD was the first to point out), and the edition of the works of Muretus, the Italian Latinist, whom he highly honoured. WOLF dedicated his famous "Prolegomena in Homerum" to RUHNKENIUS, as to the "Princeps criticorum". Among RUHNKENIUS'S pupils are the early-deceased Franeker Professor GISBERTUS KOEN (the editor of Gregorius Corinthius) and DANIEL WYTTEBACH, who — having come to the Netherlands, attracted by the fame of RUHNKENIUS'S learning, and having taught for some time at Amsterdam — succeeded him at Leyden in 1799. He is a good Latinist; as a critic, however, he is very much inferior to his predecessor. He devoted himself especially to the study of the Greek philosophers. His edition of Plutarch's "Moralia" is well known and still useful. WYTTEBACH'S teaching was the making of many pupils: D. J. VAN LENNEP (1774–1853), Professor at Amsterdam from 1799 until his death, and the editor of Ovid's "Heroides" and Hesiodus; W. L. MAHNE (first Professor at Ghent, and after the severance of Belgium and the Netherlands Professor at Leyden from 1831), a man of mediocre talents, who published a good deal about the history of philology; the philosopher PH. W. VAN HEUSDE, Professor at Utrecht, and JOHN BAKE, who succeeded WYTTEBACH after his death.

In the 19th century the critical treatment of the classics strongly comes to the front, indeed becomes predominant, often to the disadvantage of the realia. Here we should first of all mention P. HOFMAN PEERLKAMP (1786–1865), Professor at Leyden from 1823 until 1848, whose hypercritical

editions of Horace and Virgil give proof of his great erudition and genius, but who fortunately formed no school; JOHN BAKE (1787—1864), a clever Latinist, author of the “*Scholica Hypomnemata*”, and to whom part of the honour is due of having discovered the genius of COBET; and C. J. C. REUVENS, the early-deceased archaeologist. We find at this time VAN HEUSDE at Utrecht taught contemporary with him, as also P. VAN LIMBURG BROUWER at Groningen.

The latter part of the 19th century is entirely controlled by the genius of C. G. COBET (1813—1889), who after an excellent preparation — he had been given the opportunity of travelling in Italy for five years in order to study the Greek codices — became Professor at Leiden in 1845. His grammatic-critical treatment of Greek and also Latin authors, based on an indefatigable reading of those authors themselves and supported by an unequalled palaeographic knowledge, made him the first Graecus of his time, a scholar who can only be compared with SCALIGER and BENTLEY. Every philologist is acquainted with his “*Variae*” and “*Novae Lectiones*”, first published in the “*Mnemosyne*”, of which for many years he was the editor. He could speak Latin as but few have ever done.

S. KARSTEN, the editor of many Greek philosophers, was teaching at Utrecht in COBET's time; at Amsterdam J. C. G. BOOT, known for his publication of the “*Epistolae ad Atticum*”; and at Utrecht again the younger C. M. FRANCKEN, editor of Lucanus. At Leiden COBET's colleagues were J. G. PLUYGERS, and the latter's successor J. J. CORNELISSEN, in whose teaching the *realia* once more became prominent. Amongst the pupils of COBET are the intellectual S. A. NABER at Amsterdam, T. J. HALBERTSMA and H. J. POLAK at Groningen; at Utrecht J. VAN DER VLIET, a man of general knowledge, also well known as a Sanscritist, and H. VAN HERWERDEN; and finally COBET's successor at Leyden, J. VAN LEEUWEN, the profound scholar and commentator of Aristophanes and editor of Homer (together with M. B. MENDES DA COSTA), as also the author of the “*Enchiridion Dictionis Epicae*.”

ORIENTAL LITERATURE BY C. VAN ARENDONK.

WITH respect to Oriental languages University education in the Netherlands can boast a long series of eminent professors. Up to the latter part of the nineteenth century this branch of learning embraced chiefly Semitic languages; in this group Hebrew especially — being indispensable to the knowledge of the Old Testament — took a foremost place, by the side of which Arabic and Aramaic were closely studied. The importance of Arabic for the commercial and diplomatic intercourse with the Mohammedan States and rulers of Western Asia and North Africa was conducive to the study of this language.

A short time after the foundation of the Leyden University (1575), the learned DRUSIUS (†1616), who from 1572—1576 had taught Hebrew, Chaldaic and Syriac at Oxford, was entrusted with the instruction of these languages. In 1585 he accepted the appointment at the newly-opened University of Franeker, where his lectures drew students from most European countries. Feeling himself a linguist first of all, he held — for his time — a rather free point of view with respect to the interpretation of the writings of the Old Testament (Works: “Opuscula quae ad grammaticam spectant”, Franeker, 1609; “Grammatica linguae sanctae nova”, Franeker, 1612, etc.). In 1586 the instruction of Hebrew in the Leyden University was entrusted to the learned printer RAPHELENGIUS, at first Professor Extraordinarius, and from 1587 Ordinarius. His “Lexicon Arabicum”, for which he made use of SCALIGER’s “Thesaurus Linguae Arabicae”, was afterwards (Leidae 1613 ex officina auctoris) published with “Observationes” by THOMAS ERPENIUS, who had, urged thereto by SCALIGER, set himself to the study of Arabic in Paris. ERPENIUS was in 1613 made extraordinary and in 1618 ordinary

Professor of Oriental languages, Hebrew excepted, and was in 1620 also charged with the instruction of Hebrew. He may be considered the founder of the scientific study of Arabic in Europe; for rather more than a century and a half his "*Grammatica Arabica*" (Leidae 1613) — several times reprinted and revised — served as a guide for the study of Arabic. ERPENIUS, who had an Arabic printing office fitted with all appliances at his own expense, further published amongst other works: "*Grammatica arabica dicta Gjarumia . . . cum vers. lat. et comment.*," Leidae ex Typographia Erpeniana, 1617. His "*Historia Saracenica, arabice et latine*" (al-Makīn's historical work) was published shortly after his death with an introduction by GOLIUS, while L'EMPEREUR published his "*Grammatica Aethiopica*" and "*Grammatica Syriaca et Chaldaica*."

ERPENIUS († 1624) was succeeded by his disciple JACOBUS GOLIUS (1625—1667) who had, at his tutor's suggestion, betaken himself in 1622 to Morocco (Saffi) for the study of Arabic, returning in 1624 with a number of Mss. In order to enrich his knowledge of languages the Trustees of the University enabled him to travel in Syria and Asia Minor (1625—9) whence he returned with many Oriental Mss. His "*Lexicon Arabico-Latinum*," Lugd. Bat. 1653, was continually in use up to the nineteenth century. From his pen are the following text-editions: *Kitāb 'Adjā ib al-Maqlūr fi Akhbār Timūr*, Ahmedis Arabsiadæ Vitæ et Rerum gestarum Timuri Historia," Lugd. Bat. 1636; "*Kitāb Muḥammed b. Kathir al-Farghānī fi 'l-Ḥarakāt al-samāwīya wa-Djawāmi' 'Ilm al-Nudjūm*, Muhammedis fil. Ketiri Ferganensis *Elementa astronomica*," Amstelodami, 1669. He had a profound knowledge of Turkish, and as the results of his studies of Persian he left a "*Lexicon Persicum*," which was afterwards included in CASTELL'S "*Lexicon Heptaglotton*," besides translations of Ḥāfiz and Djāmī. In his later years he also applied himself to Chinese. GOLIUS was the teacher of LEVINUS WARNER, a serious student of Turkish and afterwards Ambassador of the States-General at the Porte, who bequeathed his highly important collection of Oriental Mss. to Leyden University. An eminent contemporary of GOLIUS

was LUDOV. DE DIEU, author of excellent works, such as "Gramm. linguarum orient. Hebr., Chald. et Syr., inter se collatarum", Lugd. Bat. 1628; and "Rudimenta Linguae Persicae", Lugd. Bat. 1639.

In 1627 CONST. L'EMPEREUR († 1648) was made Professor of Hebrew and Chaldaic; he was a profound scholar of Jewish literature ("Clavis Thalmudica," hebr. et lat., Lugd. Bat. 1634). At Leyden the Oriental languages, especially Hebrew, were further represented in the course of the seventeenth century by CODDAEUS (1601—1619), UCHTMANN (1648—1679), HULSIUS (1668—1685) and J. TRIGLAND (1686—1692).

At Franeker we see in this century, besides DRUSIUS, SIXT. AMAMA (1616—1629; "Grammatica Ebraea Martinio-Buxtorfiana etc.", Amstelodami. 1625, 1628, 1634; "Ebreysch Woord-boek", Fran. 1628), FULLENIUS (1629—1636), COCCEJUS (1636—1650; "Lexicon et Commentarius Sermonis Hebraici", Lugd. Bat. 1669), J. G. TERENTIUS (1651—1677; "Liber Jobi", chald. et lat., c. notis, 1662; "Gymnasium [also "Manuale"] Chaldaicum", Fran. 1664, etc.), VAN DER WAYEN (1677—1680), C. VITRINGA (1680—1682; "De Synagoga vetere Libri III", Fran. 1696) and J. RHENFERD (1682—1712). The latter also gave his attention to Palmyrenian and Phoenician ("Opera philologica", Traj. 1722).

The Professors of this same period at Groningen were: JAC. ALTING (1643—1679; "Fundamenta Punctuationis Linguae Sanctae", Groningae 1654, etc.); and JOH. BRAUN (1680—1708; "De Vestitu Sacerdotum Hebraeorum", Amstelodami 1680). At Utrecht: JOH. LEUSDEN (1653—1699), known for his "Clavis Hebr. Vet. Test.", Lugd. Bat. 1673, and especially for his edition of the Old Testament (Amsterdam 1660, 2nd ed. 1667). At Harderwyk, besides L'EMPEREUR (1619—1627), there were amongst others H. VAN DIEST (1627—1640) and JOH. MEIER (from 1684).

The direction taken by the study of Oriental languages in the eighteenth century was fixed by ALBERT SCHULTENS and his school. Whilst the study of Arabic and Aramaic had in the previous century not been entirely without influence on that of Hebrew, in general the Rabbinical tradition

dominated here. It is SCHULTENS' great merit to have brought out the worth of the so-called "Dialects" for Hebrew, whereby the study of this language was led into fresh paths. In connection with this much attention was especially devoted to Arabic. As an accompaniment to these studies, a serious inquiry was made, amongst other things, into the geography of Palestine and neighbouring countries, and the religious institutions of Israelites and Mohammedans. The study of Persian and Turkish, however, that had been inaugurated in such a happy manner by GOLIUS and WARNER, fell into the background in this period.

In 1710 the chair for Oriental languages at Leyden was filled by JOH. HEYMAN († 1737), who left a catalogue of the Oriental Mss. in manuscript. After having taught Hebrew as a Lecturer since 1680, C. SCHAAF († 1729) was made extraordinary professor of Oriental languages ("Opus Aramaeum, etc.", Lugd. Bat. 1686; "Lexicon Syriacum concordantiale", ibid. 1717). As Professor at Franeker (1713—1729) and as Interpreter Legati Warneriani and Professor at Leyden (until his death in 1750), A. SCHULTENS demonstrated in numerous works the connections of Hebrew with the cognate languages, especially Arabic, both grammatically and lexicographically ("Thomae Erpenii Grammatica Arabica cum Fabulis Locmanni . . . acc. Excerpta Anthologiae. . . quae inscribitur Hamasa Abi Temmam", Lugd. Bat. 1748 et 1767; "Origines Hebraeae I", Fran. 1724; Lugd. Bat. 1761; II, Lugd. Bat. 1738, 1762; "Institutiones Aramaeae" p. 1—332, s. l. e. a.; and many other works). His son J. J. SCHULTENS (1749—1778) and grandson H. A. SCHULTENS (1779—1793; before this at Amsterdam, from 1773) continued to work in this direction. The latter published among other works: "Anthol. Sententiarum Arabic" (text, Latin transl., and notes), Lugd. Bat. 1772; and "Pars Versionis Arab. Libri Colailah wa Dimnah sive Fabularum Bidpaï philosophi Indi", Lugd. Bat. 1786. His "Meidanii Proverb. Arab. Pars" was edited by N. G. SCHROEDER (Lugd. Bat. 1795).

H. A. SCHULTENS was succeeded by SCHEIDIUS († 1794; from 1765—1793 at Harderwyk); his edition with translation of Al-Djawhari's Lexicon was left unfinished. He further

published amongst other works "Ibn Doreidi Poemation", Hard. 1768; the same with Lat. translation and notes, Hard. 1786. After him S. F. J. RAU ("Descriptio et Excerpta Libri Ahmedis Teifaschi de Gemmis et Lapidibus pretiosis", Traj. 1774) and VAN DER PALM succeeded in turn as Professor of Oriental languages and Hebrew Antiquities.

In the eighteenth century the University of Utrecht numbered among its Professors the learned HADR. RELAND (1701—1718), who in his famous treatise "De Religione Mohammedica" (ed. II, Traj. 1717) was the first to consider the Mohammedan religion from a more liberal point of view and refuted many foolish conceptions concerning this religion. He occupied himself not only with Semitic studies, but also with Persian and with several languages of the Far East, such as Malay and Javanese ("Palaestina ex Monumentis vet. illustr.", Traj. ad Rh. 1714; "Encheiridion Studiosi Borhaneddin Alzernouchi", Traj. ad Rh. 1709; "Dissertationes Miscellaneae", Traj. ad Rh. 1708). His successor D. MILLIUS (1718—1756) likewise applied himself to the non-Semitic Oriental languages (in "Miscellanea Orientalia", part of the "Dissertationes Selectae", Lugd. Bat. 1743). MILLIUS' place was taken by S. RAVIUS (1750—1810), who left amongst other works "Diss. de Vindemia et Torcularibus vet. Hebr.", Traj. 1755; and "Exerc. de Auctore . . . Comment. a Judaeis Siphra dicti", Traj. 1751.

At Groningen O. VERBRUGGE taught Hebrew (Old and Rabbinical) and Aramaic ("Obss. philol. de Nominum Hebr. plurali Numero", Gron. 1730) from 1717—1745. From 1748—1798 N. W. (G.) SCHROEDER was Professor of Oriental languages in that university (before this, from 1743, he had been at Marburg); he wrote a Hebrew grammar, that was particularly excellent in regard to syntax, and which was frequently used: "Institutiones ad Fundam. Linguae Hebraeae", Gron. 1766 (often reprinted). His translation of Ibn Duraid's al-Qasida al-Maqsura forms the basis of the one published by SCHEIDIUS; whilst an edition of the Hamasa with translation and notes seems to have been prevented by his death.

Amsterdam had G. SURENHUSIUS, from 1704—1729,

known for his edition of the Mishna ("Mishna c. comment. Rabbiorum, vers. Lat. et notis", Amstelaed. 1698); C. H. VONK from 1735—1753; W. KOOLHAAS from 1753—1773 ("Obs. philol. exeg. in Libros hist. V. T.", Amst. 1755); after him H. A. SCHULTENS (until 1779) and D. A. WALRAVEN (until 1804).

At the Franeker University there were during the eighteenth century, besides A. SCHULTENS (from 1713—1729), E. L. VRIEMOET ("Gramm. Altingiana et Syntaxis Buxtorfiana contracta, etc.", Fran. 1733; "Arabismus, exhibens Gramm Arabicam novam etc., Fran. 1733) during the years 1731—1760; S. H. MANGER ("Ahmedis Arabsiadæ Vitæ et Rer. gest. Timuri . . . Historia, arab. et lat.", Leovardiae 1767) from 1760—1764; J. H. VERSCHUIR ("Diss. philol. exeg.", Fran. 1773; "Opuscula", Traj. 1810) from 1764—1797; and E. J. GREVE ("Vaticin. Jesaiæ Vol. postr. a Cap. XL usque ad LXVI", Amst. 1810; "Tractatus de Metris Hebr., etc.", appendix to "Ultima Capita Libri Jobi ad Gr. vers. recensita notisque illustr.", Daventriæ 1788—1791) during 1797—1810.

The Harderwyk University saw the instruction of Oriental languages (often combined with a theological branch) entrusted to: P. ENS, as successor of J. MEIER († 1725), until 1741 ("Ordo Fundamentorum Punctuationis indicatus", Hard. 1741); G. TEN CATE, from 1741—1749; and TH. SCHELTINGA, from 1750—1765. The latter was succeeded for Oriental languages by the above-mentioned E. SCHEIDTUS, who, following the example of ERPENIUS, had an Oriental printing-office of his own at Harderwyk. When he departed (1793), his place was filled by H. MUNTINGHE (until 1798).

Meanwhile the studies of the preceding centuries, a broader view of things, and a growing intercourse had gradually roused a greater interest in the East, its literatures and history for their own sakes. By means of numerous text-editions, historical-critical and linguistic studies, the representatives of Netherlands University Education in the nineteenth century largely contributed to enriching the knowledge of the East, particularly in the field of history and the development of Islâm, and that of Indonesian philology.

In 1817 H. A. HAMAKER was made extraordinary (in 1822 ordinary) Professor of Oriental languages and Interpreter Legati Warneriani in the Leyden University; he had previously been Ling. Orient. Prof. at Franeker, since 1815. In the department of Semitic literature (especially Phœnician and Arabic) he supplied several important contributions, including "Incerti Auct. Lib. de Expugn. Memphidis et Alexandriae, vulgo adscr. Abou Abdallae Mohammedi Omari filio, Wakidaeo Medinensi," Arab. text with annot., Lugd. Bat. 1825; and "Miscellanea Phœnicia", Lugd. Bat. 1828. He also studied other Oriental languages, such as Turkish and Persian, and especially called attention to the importance of the study of Sanskrit. His successor was his pupil H. E. WEYERS (from 1835—1844), who showed his great learning in but few writings ("Spec. crit. exh. Locos Ibn Khacanis de Ibn Zeidouno" and several contributions to "Orientalia", 2 vol., Amst. 1840—6). In 1845 WEYERS' place was taken by TH. W. J. JUYNBOLL, who had previously occupied the chair of Oriental languages at Franeker (1831—1840) and Groningen. To this scholar we owe: "Lexicon Geogr. cui titulus est Marāsid al-Ittilā' 'alā Asmā al-Amkina wal-Biqā'," 6 vol., Lugd. Bat. 1850—1864; "Abu 'l-Mahāsin ibn Ṭagri Bardii Annales", 2 vol., 1852—1861 (in collaboration with B. F. MATTHES), etc.

Mention should also be made of his contemporary, R. DOZY († 1883) who, having had as his teacher the conscientious WEYERS, soon made himself known by important contributions respecting Arabic-Spanish history and was appointed Professor of Mediaeval and Modern History in 1850. The result of comprehensive, deep studies was the first critical treatment of the history of the Arabs in Spain: "Histoire des Musulmans d'Espagne, etc.", 4 vol., Leyde 1861. The preliminary studies for this work had been laid down in different text-editions ("Abdo-'l-Wāhid al-Marrēkoshi. The History of the Almohades," arab. text, Leyden 1847; 2nd ed. 1881; etc.) and treatises. His extensive reading and sharp criticism led to his "Supplément aux Dict. arabes," Leyde 1877—'80, which is indispensable to Arabists.

After JUYNBOLL's death Arabic and Aramaic were tem-



Dr. R. P. A. Dozy;
born Feb. 21, 1820; deceased April 29, 1883.
Late Professor of Mediaeval and Modern History in the University
of Leyden.

porarily taught by Dozy, until in 1866 M.J. DE GOEJE became Professor of these languages — at first extraordinary and from 1869 ordinary professor. In consequence of the reorganisation of University Education, he was in 1877 exclusively charged with the lectures in Arabic. In a number of highly important text-editions he placed the chief works of the oldest Mohammedan historians and geographers at the disposal of Arabists, these editions including "Tabari, Annales," 15 vol. (in collaboration with other scholars under DE GOEJE's direction), Lugd. Bat., 1879—1901; and "Bibliotheca Geographorum Arabicorum," Lugd. Bat., 1870—1894. By his publications: "Diwan Poetae Abu-'l-Walíd Moslim ibno-'l-Walíd al-Anǧarí," Lugd. Bat. 1875, and "Ibn Qotaiba, Liber Poesis et Poetarum," Lugd. Bat. 1904, he contributed to the knowledge of Arabic poetry. In regard to the critical treatment of texts DE GOEJE was equalled by no other scholar. Moreover, we have from his hand many important essays (including "Mémoires d'histoire et de géographie orientales," Leyde, 1862—1903; an extensive Bibliography may be found in the "Levensbericht [Biography] van MICHAËL JAN DE GOEJE", by C. SNOUCK HURGRONJE, in "Jaarboek der Kon. Akad. van Wetenschappen," 1909, p. 43—60).

His place was taken in 1907 by C. SNOUCK HURGRONJE, who by his stay at Mecca and his long residence in Netherlands India, where he continually came into contact with Moslems, and in consequence of his study of their religion, had acquired an extensive and profound knowledge not only of the Arabic language, but also of Islām and of Mohammedan law in particular. He lectures on Arabic and the Mohammedan law and religion. Principal works: "Het Mekkaansche Feest" [The Meccan Festival], Leyden 1880; "Nieuwe bijdragen tot de kennis van den Islām" [New contributions to the knowledge of Islām] in "Bijdragen tot de Taal-, Land- en Volkenkunde van Ned. Indië," 1882; "De Islam" in "De Gids," 1886; "Mekka I" (The Hague 1888), II (ib. 1889); "Bilder aus Mekka," ib. 1889; "Le Droit musulman" in Rev. de l'Hist. des Religions," vol. XXXVII (1898); "Nederland en de Islām", Leiden 1911 (French transl. "Politique musulmane de la Hollande"), 2^d ed., 1915.

In regard to Arabic linguistics: "Mekkanische Sprichwörter und Redensarten," The Hague 1886, and contributions to the knowledge of the dialect of Ḥaḍramût in various articles. In the field of Indonesian philology: "Studiën over Atjehsche klank- en schriftleer," Batavia 1892; "Atjehsche taalstudiën," Batavia 1900 ("Tijdschrift v. h. Bataviaasch Genootsch." vol. XLII); in that of Indonesian ethnography: "De Atjehers," 2 vol., Batavia—Leiden, 1893—'94; English translation: "The Achenese," Leyden 1906; "Het Gajoland en zijne bewoners" [The Gayō Country and its Inhabitants], Batavia 1903.

H. OORT was appointed in 1875 for University instruction exclusively in Hebrew and Israelitish Antiquities. His teaching embraced also Rabbinical Hebrew, whereas his studies by preference comprised the Israelitish literature and religion and Judaism. Under his direction a new critical translation of the Old Testament was made ("Het Oude Testament", Leiden 1899). He published a revised edition of his "De laatste eeuwen van Israels volksbestaan" in 1915 (Leiden). Various scientific contributions from his pen appeared in the "Theologisch Tijdschrift". After OORT had resigned in 1907 he was succeeded by G. WILDEBOER, before this Professor of Old Testament Literature at Groningen ("Het ontstaan van den Kanon des Ouden Verbonds", 4th ed., Gron. 1908; Engl. transl., London 1894; "De Letterkunde des Ouden Verbonds", 3^d ed., Gron. 1903; etc.). A J. WENSINCK became his successor in 1912 ("Legends of Eastern Saints", 2 vol., Leyden 1911—'13; some articles in "Der Islam", etc.).

From 1877 J. P. N. LAND, Professor of Philosophy, for whom this branch of study had been combined with the Oriental languages at Amsterdam (1864—'72), sometimes gave private lectures in Syriac ("Anecdota Syriaca", 3 vol., Lugd. Bat. 1862—'70; "Hebreeuwsche Gramm.", Amst. 1869). After LAND's death (1897) lectures in Aramaic were given by Prof. B. D. EERDMANS (of the theological faculty, from 1898) and, from 1902, by the private tutor Dr. J. MARQUART, who also taught Ethiopian and Armenian. Since 1912 this Semitic branch is treated by Professor WENSINCK.

The professors of the theological faculty, C. P. TIELE



Dr. M. J. DE GOEJE,
born Aug. 13, 1836; deceased May 17, 1909.
Late Professor of Arabic in the University of Leyden.

and EERDMANS, used to hold themselves willing to act as instructors to those who wished to be instructed in Assyrian-Babylonian. Since 1913 an extraordinary professorship has been established for this language, which was filled by G. J. THIERRY. If desired Professor EERDMANS also taught Mandaic.

Since 1902 Egyptian and Coptic have been represented at the Leyden University by Dr. P. A. A. BOESER, who, after being a private tutor, became a Lecturer in 1913 (*"Beschrijving van de Egyptische Verzameling in het Rijksmuseum van Oudheden te Leiden"*, 6 vol., Leiden 1905—'13).

A lectureship in Persian and Turkish was established in 1885 and filled by Dr. M. TH. HOUTSMA, who also succeeded Dr. C. SNOUCK HURGRONJE as a Lecturer on the Institutions of Islām, when the latter left for the East Indies in 1889. The place of HOUTSMA, who was appointed Professor at Utrecht in 1890, was taken by Dr. H. D. VAN GELDER.

At Utrecht the Chair of Oriental languages was occupied in 1810 by J. H. PAREAU (besides some works on Hebrew Literature, *"Commentatio de Amralkeisi Moallakah"*, Traj. ad Rh. 1828; etc.) until 1832; then, from 1831—1855, by J. C. SWIJGHULJSEN GROENEWOUD (*"Institutio ad Gramm. Aramaeam ducens"*, Traj. ad Rh., 1845 etc.); after him, from 1856—1868, by H. C. MILLIES, who also gave his attention to various languages of the East Indian Archipelago (*"Recherches sur les monnaies des indigènes de l'archipel Indien et de la Péninsule Malaie"*, La Haye, 1871). He was succeeded by P. DE JONG, to whom several useful Arabic text-editions are due (*"At Tha'alibí, Latáifo 'l-Ma'árif"*, Lugd. Bat. 1867; *"Ad-Dhahabí, al-Moshtabih"*, ibid. 1881); he further prepared vol. III and part of vol. IV of DE GOEJE's edition of al-Tabari's historical work. M. TH. HOUTSMA succeeded him in 1890, after having been Adjutor Interpretis Legati Warneriani and Lecturer in Persian and Turkish at Leyden. His teaching embraces Hebrew and Israelitish Antiquities, Aramaic and Arabic. Several important text-editions were published by him (including *"Ibn Wādhīh qui dicitur Al-Ja'qubī Historiae"*, 2 vol., ibid.

1883; "Recueil de Textes relatifs à l'Histoire des Seljoucides", 4 vol., *ibid.* 1886—1902; he further contributed to the edition of the Leyden Catalogue of Oriental Mss. and to the Tabarī edition). Interesting contributions from his pen are amongst others: "Iets over de Israëlietische vastendagen" in "Verslagen en Meded. der Kon. Akad. van Wetenschappen", Afd. Letterkunde, 4^{de} reeks, II, 1898, and "Het skopelisme en het steenwerpen te Mina", *ibid.*, VI, 1904. At present the "Enzyclopaëdie des Islām" (also in a French and English edition) is being published under his direction.

The University of Groningen had G. WOLTERS, for Oriental languages from 1813—1840; then, until 1845, TH. W. J. JUYNBOLL, after him J. J. P. VALETON ("Ta'ālībī Syntagma dictorum brevium et acutorum", arab. et lat., Lugd. Bat. 1844). His successor in 1877 was F. J. VAN DEN HAM ("Disputatio pro Religione Mohammedanorum adv. Christianos", text. Arab., Lugd. Bat. 1890), whose place has been taken since 1913 by F. M. TH. BÖHL ("Die Sprache der Amarna-briefe mit besonderer Berücksichtigung der Kanaanismen", Leipzig, 1909; etc.). Besides Hebrew (also Mishnaic), the latter teaches Babylonian-Assyrian.

In the University of Amsterdam the instruction in Oriental languages was entrusted in 1804 to J. WILLMET ("Lex. linguae Arab. in Coranum, Haririum et Vitam Timuri", Roterod. 1784; a revised edition of the Bible in Malay, Haarlem, 1824). In 1832 T. ROORDA was appointed extraordinary (in 1835 ordinary) professor, who, with the application of his ideas about the logical conceptions that form the basis of every language, devoted himself by preference to grammatical studies ("Grammatica Hebraea", 2 vol., Lugd. Bat. 1831—3; "Grammatica Arabica", Lugd. Bat. 1835; revised ed., Leov. 1858). ROORDA acquired special merit in regard to the scientific study of the Javanese language. When in 1842 he went to Delft as Professor of this language, P. J. VETH succeeded him, who especially applied himself to the study of the geography and ethnography of the East Indies ("Liber as-Sojutii de nominibus relativis, inser. Lubā al-Lubāb", 2 vol., Lugd. Bat. 1840—1851).

When he left the Amsterdam University, his place was taken in 1864 by J. P. N. LAND, who was appointed at Leyden in 1872. His successor, H. OORT, followed him there in 1875. After J. G. DE HOOP SCHEFFER had temporarily filled this place, the Chair for Hebrew and Israelitish Antiquities was occupied by J. C. MATTHES from 1877 – 1906, whose scientific studies lie in the field of Hebrew literature and the history of the Israelitish religion (“Hèt boek Job vertaald en verklaard”) [The Book of Job translated and elucidated], 2 vol., Utrecht 1865; various treatises in “Theol. Tijdschr.” and “Teyler’s Theol. Tijdschrift”). The same can be said of his successor H. J. ELHORST (“De profetie van Micha”, 1891; “De profetie van Amos”, 1900, etc.).

The Universities of Harderwyk and Franeker, having been abolished during the French period, revived as Athenaea. That at Harderwyk existed only for a very short time. The Franeker Athenaeum was maintained until 1843.

Lectures in Hebrew, Assyrian, and Arabic are given in the Free University (founded at Amsterdam in 1880) by Professor C. VAN GELDEREN.

In the course of the nineteenth century a place was given in Netherlands University instruction to Javanese and Malay and also to other languages of the East Indian Archipelago.

In the Royal Academy of Delft (1842 – 1863), at the Government Institution for the instruction of Indian Languages, Geography, and Ethnography (1864 – 1877), at the Municipal Institution for the training of officers in the Indian Civil Service at Delft (1864 – 1902), and at a similar Municipal Institution at Leyden (1877 – 1891), these languages were taught with the exclusively practical object of training officers for the Civil Service of the Colonies.

After the reorganisation of University Education (1877) it became possible to obtain a doctorate in the Philology and Literature of the East Indian Archipelago, and Chairs for Javanese and Malay were established in the Leyden University.

Since 1902 the Indian Civil Service students generally attend the lectures at this University.

As has been said before, the founder of the scientific study of Javanese was T. ROORDA, Professor of this language in the Academy at Delft from 1842—1863 and from 1864—1874 at the Government Institution at Leyden. For a long time his "Javaansche Grammatica" [Javanese Grammar] (Amsterdam 1855; revised as "Beknopte Javaansche Grammatica", Amst. 1874) remained, in many revised editions, a book of study that was much in demand, notwithstanding defects resulting from the author's peculiar views concerning the theory of language, which one has to know in order to understand his book. He earned merit in regard to the lexicography of Javanese on account of the revision and edition of GERICKE's "Javaansch-Nederduitsch Woordenboek" [Javanese-Netherlands Dictionary] (Amst. 1847), publishing a very extensive "Supplement" to this in collaboration with J. J. MEINSMA (Amst. 1862). A new edition ("Jav.-Nederl. Woordenboek", Amst. 1871—74) he was unable to entirely complete. Besides these extensive works, he edited several important Javanese texts.

In the Leyden University A. C. VREEDE was appointed Professor of Javanese in 1877; he held this post till 1908. He finished the revision of ROORDA's Dictionary and published amongst other works several new editions of the latter's Javanese Grammar (5th edition, Amst. 1906). He also compiled a Madurese grammar and prepared a few text-editions in this language. VREEDE was succeeded in 1909 by J. C. G. JONKER, who also made special studies of several other Indonesian languages, such as Bimanese, Rottinese, etc., which he made known by the publication of grammars, dictionaries and texts ("Rottineesche Spraakkunst", Leiden 1915; etc.). He also lectures on the Macassar and Buginese languages.

The Malay Chair in the Leyden University was occupied in 1877 by J. PIJNAPPEL (till 1889), before that time Professor of this language successively at the Delft Academy (1846—64) and at the Government Institution at Leyden. He published a "Maleisch-Hollandsch Woordenboek" [Malay-Netherlands Dictionary] (3rd ed. Haarlem, 1884), and

"Maleische Grammatica", Amst.-Haarlem, 1888. In 1890 the instruction of this language was entrusted to the Lecturer H. C. KLINKERT. His principal work is his "Nieuw Maleisch-Nederlandsch Woordenboek", Leiden 1893; 2nd ed., ib. 1901—02; 3rd ed. in preparation. He also prepared the editions of some Malay texts.

KLINKERT was succeeded in 1904 by Professor CH. A. VAN OPHUIJSEN, who lectures on the Malay language and literature, the comparative grammar of the languages of the East Indian Archipelago and the Menangkabaw and Batak languages. Besides numerous contributions concerning the grammar and lexicography of the Malay languages in the "Tijdschrift van het Bataviaasch Genootschap" [Periodical of the Batavia Society], he published a "Maleische Spraakkunst", Leiden 1910; "Maleisch Leesboek" [Malay Reader], ib. 1912; further several text-editions, including "Bataksche Teksten (Mandailingsch Dialect)", I, ib. 1914; etc.

G. J. GRASHUIS has been Lecturer of Sunda since 1876; different text-books for the study of this language came from his pen.

The instruction in the Geography and Ethnography of the Indian Archipelago was in 1877 entrusted to P. J. VETH, who since 1864 had lectured on these subjects as a professor in the Government Institution at Leyden. His principal work was "Java, geographisch, ethnologisch, historisch", 3 vol., Haarlem, 1875—1884 (2^d ed. revised by SNELLEMAN and NIERMEYER, *ibid.* 1896—1907). He was succeeded in 1885 by G. A. WILKEN († 1891), whose great erudition enriched knowledge in the field of Semitic and Indonesian ethnology ("De verspreide Geschriften van Prof. Dr. G. A. WILKEN", verzameld door Mr. F. D. E. VAN OSSENBRUGGEN, 1912). WILKEN was succeeded by J. J. M. DE GROOT. When the latter was appointed Professor of Chinese (1904), the Chair for the geography and ethnography of the Indian Archipelago was filled by A. W. NIEUWENHUIS ("Quer durch Borneo", Leiden 1904—7; etc.).

Amongst the Professors of the Delft Institute G. K. NIEMANN may be mentioned, who lectured on the Macassar and

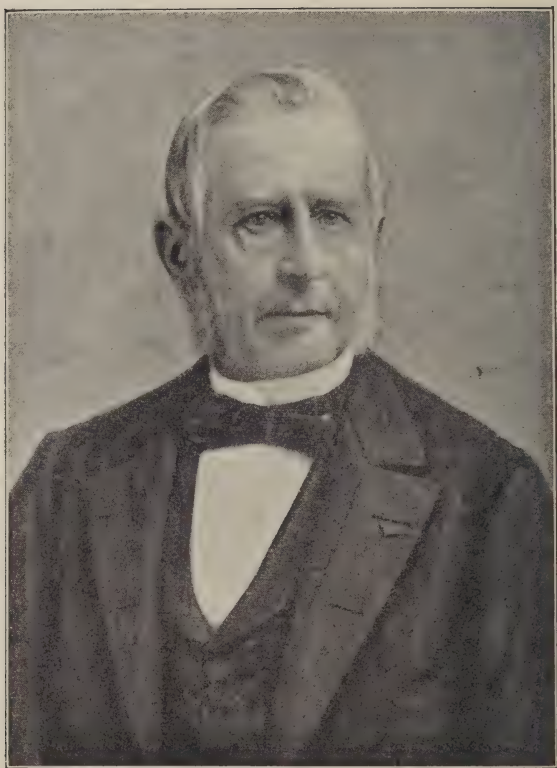
Buginese languages and on the geography and ethnography of the East Indian colonies. He wrote on the Alfoor language and published Malay and Buginese texts.

Scholars who much contributed to enriching the knowledge of the Indonesian languages were B. F. MATTHES, who embodied his wide knowledge of the Macassar and Buginese languages in dictionaries, grammars and a number of text-editions; A. B. COHEN STUART, an eminent student of Javanese; H. N. VAN DER TUUK, a thorough linguist, especially in the field of Old Javanese, Balinese, and Batak, and a pioneer of comparative Indonesian philology; J. BRANDES, known for his studies of comparative Indonesian philology and Javanese palaeography; and the Sanscritist J. H. KERN, who made fundamental studies of Old Javanese and of comparative Indonesian philology and still makes contributions on these subjects.

At the University of Amsterdam instruction in Malay is given by the private tutor Dr. A. A. FOKKER. In the Polytechnic High School at Delft T. J. BEZEMER lectures on Malay and Javanese, while C. SPAT teaches Malay in the Commercial High School at Rotterdam.

After the reorganization of University education the Leyden University also got a chair for Chinese. This was filled in 1877 by G. SCHLEGEL († 1903), who wrote amongst other works: "Nederlandsch-Chineesch Woordenboek", Leyden 1884–1891; and "Problèmes géographiques. Les peuples étrangers chez les historiens chinois", Leyden, 1896 (from the periodical "T'oung Pao", 1892–95). After him the instruction of this language was entrusted to J. J. M. DE GROOT, of whose works we may here mention: "The Religious System of China, etc.", vol. I—VII, Leyden 1892—1910; and "The Religion of the Chinese", New York 1910. Following his departure for Berlin (1911) the chair for Chinese has not yet been filled ¹⁾.

¹⁾ If this were not chiefly a survey of the University instruction in Oriental languages, we might mention several more scholars who have successfully applied themselves to the Semitic and Indonesian languages and literatures.



Dr. M. DE VRIES, born Nov. 9th, 1820, († Aug. 9th, 1892).
Professor of Netherlands Literature in the University of Leyden.

NETHERLANDS LITERATURE.

BY H. J. A. RUYS.

THE first professor at Leyden, officially appointed in 1797, was MATTHIJS SIEGENBEEK (1774—1854). The most important of his numerous historical and literary works were, we may note, his: "Verhandeling over de Nederduitsche spelling" [Treatise on Netherlands spelling] (1804), his "Woordenboek voor de Nederduitsche Spelling" [Dictionary of Netherlands spelling] (1805), adopted as the official spelling by the Government of that time and used until 1883 (when the new spelling was adopted, which had been laid down by Dr. L. H. TE WINKEL and Dr. M. DE VRIES, in 1865) and his: "Geschiedenis der Leidsche Hoogeschool" [History of the Leiden University] 2 vols. (1829). From 1831 JOH. MATTH. SCHRANT (1783—1866), at first Professor at Ghent, was his colleague, and took his place when he retired in 1844. More famous than SCHRANT was his successor MATTHIJS DE VRIES (1820—1892), the founder of Netherlands philology and the first who studied Middle Netherlands in a scientific manner. After having edited among other works HOOFT's "Warenar" (1843) and BOENDALE's "Lekenspieghel" (1844—'48), with the meritorious "Glossarium", he became professor at Groningen in 1849 and at Leyden in 1853. Besides a great many minor articles and studies on Middle Netherlands philology and critical text-editions, as, for instance, MAERLANT's "Spieghel Historiae" (1863—1879), he began in 1864 his principal work "Het Woordenboek der Nederlandsche Taal" [Dictionary of the Netherlands language], in which he was supported by the Government. Others who worked at this dictionary were: Dr. L. A. TE WINKEL (until 1868), with whom he also published a "Woordenlijst voor de spelling der Nederl. taal" [Vocabulary for the spelling of the Netherlands language] in 1866, which had several reprints; Dr. E.

VERWIJS (1869—1878), Dr. P. J. COSIJN (1871—1878); and further Dr. A. KLUYVER (1883—1911), Dr. J. W. MULLER (1888—1911), Dr. W. L. DE VREESE (1891—1895) and Dr. C. C. UHLENBECK (1891—'92). The present editors are: Dr. A. BEETS (since 1888), Dr. G. J. BOEKENOOGEN (since 1896), Dr. J. HEINSIUS (since 1905), Dr. J. A. N. KNUTTEL (since 1906) and Dr. R. VAN DER MEULEN (since 1911). The letters A, B, C, G, H, I, K, M, N, O are finished, and the editors are at work on D, J, L, P, R.

With the new University Education Act of 1877, Dr. P. J. COSIJN (1840—1899) was made Professor of Old Germanic, by the side of DE VRIES. He began his scientific career with practical little grammar-books: "Vergelijkende spraakleer" (1866), "Nederlandsche spraakkunst met oefeningen" (1867—1888), etc. Afterwards he passed on to Germanic Philology and wrote: "De Oud-Nederl. Psalmen" [the Old Netherlands Psalms] (1873), "Altwestsächsische Grammatik" (1888), "Aanteekeningen op de Béowulf" (1892) and "Over Angelsächsische Poezie" (1899).

With KERN, VERDAM and VERWIJS, he was among the first editors of the "Tijdschrift voor Nederl. Taal- en Letterkunde" [Periodical for the Netherlands Language and Literature]. Another chair in the Literary Faculty was filled by JOHAN HENDRIK CASPAR KERN (born in 1833). After having begun to work at the "Sanskrit-Wörterbuch" of O. BÖHTLINGK and R. ROTH in 1857 and having become Professor at Benares in 1863, he came to Leyden in 1865, as Professor of Sanskrit, where he remained at work until 1903 with increasing fame. Among his principal pupils are SPEYER, VAN DER VLIET, CALAND and WARREN. A brief summary of his labour may be given in the following manner: I. Indian and Iranian Philologies and Antiquities (e.g. "Çakuntalâ of het Herkenningsteeken" by Kâlidâsa, studies on and editions of Varâhamihira, etc.). To this division also belongs his "Manual of Indian Buddhism", in BÜHLER's "Grundriss" (1896) and his "Geschiedenis van het Buddhisme in Indië" (1882—'84). II. Malay-Polynesian Philology and Antiquities ("Kawi-studiën", "Wrtta-Saṁcāya", "Rāmāyaṇa"). III. The science of the inscriptions in the Indian Archipelago and in Farther

India. IV. Germanic languages, comparative philology ("Handleiding bij het Onderwijs der Nederlandsche Taal" [Manual of instruction in the Netherlands language], "Die Glossen in der Lex Salica", "Nomina geografica Neerlandica"). V. Accounts, biographies, reviews and reports.

Besides linguistics, Netherlands literature found scholars in W. J. A. JONCKBLOET (1817—1885), who became a Professor first at Deventer and Groningen, and in 1877 at Leyden. Following some 17th century editions, he critically edited several Middle Netherlands texts: "Roman van Walewein" (1846-'48), "Lancelot" (1846—'49), "Karel den Groeten" (1848), "Dietsche Doctrinale" (1842), "Beatrijs" (1859), some French novels: "Guillaume d'Orange" (1854), "Roman de la Charrette" (1850) and some more extensive works: "Geschiedenis der Middelned. dichtkunst" [History of Middle Netherlands poetry], 3 vols. (1851—'55) and "Geschiedenis der Nederlandsche letterkunde" [History of Netherlands Literature], 6 vols. (1868-1889, 4 editions). JAN TEN BRINK (1834-1901) was his successor. He wrote many literary sketches and studies ("Jan Starter en zijn wijf", "De Bredero's", "De Roman in brieven", etc.), some novels, and is still remembered for his manual: "Geschiedenis der Nederlandsche letterkunde" [History of Netherlands Literature] (1895—'97).

When KERN retired he was succeeded by his pupil JACOB SAMUEL SPEIJER (1849—1913), who had been Professor at Amsterdam and Groningen. The latter first devoted himself to the study of Latin philology, and afterwards to that of Sanskrit; wrote a "Vedische und Sanskrit Syntax" in BÜHLER's "Grundriss", "De Indische theosophie en hare beteekenis voor ons" [Indian theosophy and its importance for us] (1910), published Indian texts and translations in the "Bibliotheca Buddhica" and the "Sacred Books", and popular works on Buddhism and Hinduism (1911).

The present Professors of the Leyden faculty of Netherlands philology and literature are: J. VERDAM (since 1891), first Professor of Middle Netherlands and Netherlands philology in the University of Amsterdam; next to his many editions of Middle Netherlands texts, we may draw attention

to his "Geschiedenis der Nederlandsche Taal" [History of the Netherlands language] (1890—1912, 3 editions) and his "Middel-Nederlandsch Woordenboek" [Middle Netherlands dictionary], a continuation — at first in collaboration with Dr. E. VERWIJS — of what MATTH. DE VRIES started in 1864. The first number of this enormous work appeared in 1882. At the present moment he is as far as V, and the dictionary will be finished within 8 years. C. C. UHLENBECK (since 1899), who teaches Gothic, Anglo-Saxon, Middle High German and the old languages and literatures of the Germanic peoples, and who has made his mark by his writings on the Baltic-Slavonic, Basque, Gothic, Eskimo and Algonkin languages. G. KALFF (since 1902), Professor of Netherlands literature and its history, whose dissertation, "Het Lied in de Middeleeuwen" [The Ballad in the Middle Ages] (1889) and later work "Geschiedenis der Nederlandsche Letterkunde in de XVI^e eeuw" [History of Netherlands Literature in the 16th century] (1889) and his principal work "Geschiedenis der Nederlandsche Letterkunde" [History of Netherlands Literature], in 7 vols. (1906—1912), deserve to be mentioned, besides editions of mediaeval and 17th century works. J. PH. VOGEL (since 1914), whose department is Sanskrit and its Literature and Indian Antiquities.

In the Utrecht Literary faculty we should first mention : ADAM SIMONS (1770—1834); who became a Professor in 1816 and to a certain extent made himself known as a poet ("Lof der Welsprekendheid", 1809, "Ode aan mijn landgenooten", 1824); LOD. GER. VISSCHER (1797—1859), who was first appointed to a chair at Louvain and afterwards became extraordinary and in 1834 ordinary professor at Utrecht, where he published a "Handleiding" — which has now become antiquated —, "Bijdragen tot de Nederlandsche Letterkunde" [Contributions to Netherlands Literature] (1829, 1835, 1839) and also an edition of the "Ferguut" (1838). Of greater fame was WILLEM GER. BRILL (1811—1896), who became a professor in 1859, and is known for his "Hollandsche Spraakleer" [Netherlands Grammar] (Etymology and Syntax), editions of STOKES' "Rymkroniek" (1885), RIEBEEK'S

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“Dagverhaal” (1884–1893), “Sinte Brandane” (1871) and BOGAERS’ “Taalkundige Opstellen” (1872). Further, he has given us a great many discourses and some works on the modern languages. After BRILL had retired in 1882, he was succeeded by HENRI ERN. MOLTZER (1836–1895), who had been Professor at Groningen since 1865. His “Bibliotheek van Middel-Nederl. Letterkunde” [Library of Middle Netherlands Literature] is important; in this he himself published: “Floris ende Blancefleur” (1879), “Middel-Nederl. dramatische poëzie” [Middle Netherlands Dramatic Poetry] (1875) and “Levens en Legendes van Heiligen” [Lives and Legends of Saints] (1891). His successor was the above-mentioned G. KALFF, whilst from 1882 linguistics were taught by JOHAN HENDRIK GALLÉE (1847–1908) and Sanskrit from 1891 by the classical Scholar JOA. VAN DER VLIET (1847–1902). GALLÉE’s merits lie in the province of linguistics, though his “Akademie en Kerkeraad” (1877) and other works are also of some value. We may mention: “Altsächsische Grammatik” (1891), unfinished, “Gutiska” (1880–1882), “Altsächsische Sprachdenkmäler” and in the field of folklore: “Woordenboek van het Geldersch-Overijsselsch dialect” [Dictionary of the dialects of Gelderland and Overijssel] (1896) and “Het Boerenhuis in Nederland” [The Farmhouse in the Netherlands 1907].

At the present time the Netherlands language and literature is taught at Utrecht by: J. W. MULLER (since 1902), who has a thorough knowledge of the mediaeval “Reinaert”; J. J. A. A. FRANTZEN (since 1908) teaches comparative philology and the languages and literatures of the Germanic peoples and German; and W. CALAND (since 1906) is teacher of Indo-Germanic philology and Sanskrit. The latter especially applies himself to the study of ritual, and has written: “Altindischer Ahnencult” (1893), “Altindischer Zauberritual” and edited some Sanskrit texts (“Baudhāyana Śrauta Sūtra” and “Jaiminiya Samhita”).

At Groningen BARTHOLOMÆUS HENDRIK LULOFS (1787–1849) became Professor of the Netherlands language and elocution in 1815. His poetical and very numerous philological works,

including a "Schets van een overzicht der Duitsche taal" [Sketch of a survey of the German language] (1819), "Nederlandsche Redekunst" [Netherlands Rhetoric] (1820) and "Handboek van den vroegsten bloei der Nederl. letterkunde" [Handbook of the earliest prosperity of Netherlands Literature] (1845) have no longer any value. One of his contemporaries was GERRIT JOAN MEYER (1781—1848), who left Louvain in 1831 to go to Groningen. Though teaching Netherlands history, he most often applied himself to philology: annotated editions of "Het Leven van Jezus" ["The Life of Jesus"] (1835), "Oude Nederlandsche Spreuken en Spreekwoorden" [Old Netherlands proverbs and aphorisms] (1836) and some others. After he had been succeeded by W. J. A. JONCKBLOET (1854—1865), to whom Groningen is much indebted, owing to his "Gedenkboek der Hoogeschool" [Annals of the University] (1864) and H. E. MOLTZER (1865—1882), this chair was occupied by WILLEM LODEWIJK VAN HELTEN, who taught the Netherlands language and literature and Middle Netherlands from 1882 till 1911. We may mention as his principal works: "Nederlandsche Spraakkunst" [Netherlands Grammar] (1875—'77), "Vondel's Taal" [Vondel's language] (1881), "Middel-nederlandsche Versbouw" [Middle Netherlandsch rhythmical construction] (1884) and editions of "De Vos Reynaerde" (1887) and Anna Byns' "Refereinen" (1875—'81). When he retired he was succeeded by ALB. KLUYVER (since 1911), of great merits as a lexicographer, especially during the many years in which he worked at the Dictionary of the Netherlands language. B. SYMONS (from 1881) teaches the Indo-Germanic and Germanic languages, Gothic, Middle High German and the German language and literature. He wrote: "Untersuchungen über die sogen. Völsunga Saga" (1876) and edited the "Kudrun" (1883) and "Die Lieder der Edda" (1888). There is also a chair for Sanskrit in this University, occupied first by J. S. SPEYER, who was Professor from 1889 till 1903; and after him by JOH. HENDR. KERN (since 1901), who applies himself to the study of Anglo-Saxon, English, Sanskrit and the Slavonic languages. We may mention his "Klankleer en Uitgave der Limburgsche Sermoenen" (1891) and his

revision of F. KLUGE's "Voorgeschiedenis van het Germaansch" (1893).

Amsterdam begins with JOHANNES PIETER VAN CAPELLE (1774—1829), who was a Professor from 1815 till 1828. He edited amongst other works: "De Nederlandsche Historie van P. C. HOOFT" (1824) with notes. His successor was NICOLAAS GODFRIED VAN KAMPEN (1776—1839). The latter's "Be-knorte Geschiedenis der letteren en wetenschappen in de Nederlanden" [A concise history of literature and sciences in the Netherlands] (1821—1826), "Magazijn voor Wetenschappen, Kunsten en Letteren" [Magazine for Science, Literature and Art] (1822—1831), and "Hollandsch Magazijn" (1832), might be mentioned among numerous works of the same kind. After him came HUGO BEIJERMAN (1791—1870), succeeded in 1865 by THOMAS THEOD. HENDR. JORISSEN (1833—1889). The latter is especially famous as a historian; we will here only mention his "Constantijn Huygens-Studiën" (1871). After the Netherlands language and literature had in 1877 also become a special branch of learning at Amsterdam, J. VERDAM was appointed to the chair in 1878; and after he had gone to Leiden, JAN TE WINKEL became Professor of the Netherlands language and literature and those of the Old Germanic peoples. The knowledge of mediaeval conditions was much extended by his studies on "Maerlant's Werken beschouwd als spiegel der XIII^e eeuw" (1877), "Het kasteel in de 13^e eeuw" [The castle in the 13th century] (1879), and by editions such as the "Moriaen" (1878), the "Torec" (1875) and "Esopet" (1881); more than one work on the Netherlands language, especially on the history of this language, was published by him (e. g. in PAUL's "Grundriss der indogerm. Sprachwissenschaft"), while his literary labour culminated in his "Ontwikkelingsgang der Nederl. Letterkunde" [Development of Netherlands Literature] (1907-'12), of which at the present moment 3 vols. are finished. The Professor of Sanskrit, Comparative Philology and Old Germanic languages is RICHARD CONSTANT BOER (since 1900), who succeeded J. S. SPEYER (extraordinary professor of Sanskrit from 1888 till 1889). He especially applies himself

to the study of Norse and edited "Orvar-Odds Saga" (1888) and "Grettis Saga" (1900). In 1912 he began his series of "Altenglische Heldendichtung," including "De Béowulf." The Lecturer B. FADDEGON took his place as teacher of Sanskrit in 1908.

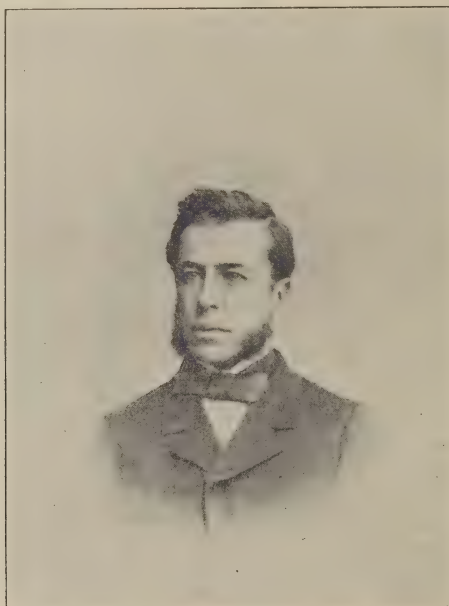
HISTORY BY P. J. BLOK.

DISTINGUISHED scholars devoted themselves to the study of history, at first especially to that of ancient history, even in the earliest years of the Netherlands Universities. The philologists JUSTUS LIPSIUS, FRANS OUDENDORP, and JACOB PERIZONIUS at Leyden should be mentioned in this connection as pioneers, while in the beginning of the seventeenth century UBBO EMMIUS of Groningen was famous for his critical research of mediaeval Frisian history, and at the end of the eighteenth ADRIAAN KLUIT of Leyden as investigator of mediaeval Netherlands history. As a rule, during the seventeenth and eighteenth centuries no place was given in our Universities to the teaching of modern national or universal history. Not until the beginning of the nineteenth was the teaching of modern history entrusted to M. SIEGENBEEK at Leyden and N. G. VAN KAMPEN in the Athenaeum of Amsterdam ; the latter is noted for his compilatory "Geschichte der Niederlande" in the earliest series of HEEREN and UKERT and for many other historical writings from his prolific pen, all aiming at the spreading of the fame of the Netherlands outside their own country.

The real study of historical science in the Netherlands Universities dates from the middle of the nineteenth century.

While R. DOZY represented universal history at Leyden from 1849 and in his "Histoire d'Espagne sous la domination Arabe" (3^d ed. Leyde, 1881) more or less followed French historiography, W. BRILL at Utrecht (from 1859), and W. HECKER at Groningen worked in a manner that was compilatory or contemplative rather than critical, whereas ROBERT FRUIN, Professor of National History at Leyden from 1859, laid the foundations for critical study of history. He followed the method of LEOPOLD RANKE and of his own, older friend BAKHUIZEN VAN DEN BRINK, author of excellent historical essays and afterwards famous as the highly scientific State

recorder. To the former FRUIN refers gratefully as his master, though he had never been among his pupils, and admires him as the impartial historian, who with sharp criticism penetrated into the deepest depths of historical life: he took him for a model. His "Tien Jaren uit den tachtigjarigen oorlog" [Ten Years of the Eighty Years' War] — which has run through six editions since 1857 (1st ed. Leyden, others the Hague) — is a model of historical research and historio-



Dr. R. FRUIN, born Nov. 14, 1823, deceased Jan. 29, 1899,
Professor of History at the University of Leyden.

graphy; the numerous articles, he had contributed to various periodicals, collected only after his death in ten volumes of "Verspreide Geschriften" (Stray Essays) (the Hague, 1901 ff.), testify to his great critical gifts, his profound historical insight and his uncommon talents as a writer, which made him worthy of the name of the "Netherlands RANKE".

His colleagues at Utrecht (at first BRILL, afterwards A. J.

WYNNE, best known as an author of text-books), TH. JORISSEN at Amsterdam, whose talents of popularisation surpassed his critical gifts, and W. HECKER at Groningen, were unable to attain to the height on which he stood.

Though FRUIN (1823—1899) had no desire to form a school, his influence on younger historians became decisive. P. L. MULLER (1840—1904), first Professor at Groningen, and afterwards Dozy's successor in the Leyden University, devoted himself to universal history exclusively; in addition to his "G. F. von Waldeck und Wilhelm III von Oranien" (the Hague, 1873—1880), we have his great work: "Documents sur les relations du duc d'Anjou avec les Pays-Bas" (the Hague 1889 ff.) and his "Onze Gouden Eeuw" [Our Golden Age] (Leiden, 1896—1898); his "Geschiedenis van onzen tijd" [History of our own times] (Haarlem, 1902 ff.) is the only big book he wrote about universal history. He is prominent by accuracy of research and broad views. At Groningen he was succeeded in 1884 by FRUIN's younger pupil P. J. BLOK, who followed FRUIN in his "Geschiedenis eener Holl. stad in de Middeleeuwen" [History of a Netherlands town in the Middle Ages] (The Hague, 1881; 2nd ed. 1910) and national historical life in his „Geschiedenis van het Nederlandsche Volk" [History of the Netherlands nation] (Groningen, Leyden, 1891—1908) and who, having come to Leyden as FRUIN's successor in 1894, applied himself to national history only. At Groningen, and since 1905 at Leyden, there worked TH. BUSSEMAKER († 1914), likewise one of FRUIN's pupils and author of a „Geschiedenis van de afscheiding der Waalsche gewesten" [History of the secession of the Walloon provinces] (Haarlem, 1895—1896), which was rewarded with a gold medal by the TEYLER Society of Haarlem. G. W. KERNKAMP, first at Amsterdam, then at Utrecht, though no pupil of FRUIN, entirely followed the latter's method and devoted himself by preference to the history of the Baltic trade. At Amsterdam he was succeeded by H. BRUGMANS, who applied himself especially to commercial history, more particularly to that of Amsterdam. At Groningen J. HUIZINGA took the place of BUSSEMAKER in 1906; he applied FRUIN's method to the history of culture and came to Leyden in 1914. J. E.

HEERES was in 1902 entrusted with the teaching of colonial history at Leyden, which until then had been regarded as a subject of small historical importance, chiefly studied by amateurs. In 1913 the new commercial University at Rotterdam appointed N. W. POSTHUMUS as Professor of History of Economics, who wrote a big book on the Leyden textile industry. In this manner FRUIN's influence made itself felt in the Netherlands universities, where it still prevails. The new professor of history in Groningen, I. H. GOSSES (1915), is also a disciple of FRUIN and BLOK, his favorite subject being mediaeval history.

The appointment of the German scholar O. OPPERMAN as Lecturer and afterwards as extraordinary Professor by the side of KERNKAMP at Utrecht, resulted in close application to mediaeval history, with the teaching of which he was specially entrusted; he tried to apply to this study in our country the method so successful in Germany. Ancient history — formerly taught by philologists as a subject of little importance, — has been represented since the passing of the new, 1877, Act on University Education, by special professors in the various universities; at Amsterdam by the conscientious philologist and student of inscriptions U. PH. BOISSEVAIN, at Leyden by the archaeologist A. E. HOLWERDA, at Groningen by the young German scholar O. WEBER, at Utrecht by the versatile H. VAN GELDER, writer of a big "Algemeene Geschiedenis" [Universal History] (Groningen, 1904). Several other branches of historical science have been taught during later years by the lecturers M. SCHOENGEL at Groningen and I. H. GOSSES and DE BOER at Amsterdam, and by TE LINTUM at Utrecht.

So we see that the modern study of history in The Netherlands owes a great deal to the development of historical science in Germany. Historical seminaries were established in this country also, though on much simpler lines. Of late, however, we observe a tendency to make these seminaries more like those in Germany, whereas until now they have borne more or less the character of "privatissima" for those who wished to apply themselves specially to the study of history.

Local and provincial history is chiefly in the hands of the local and provincial recorders, among whom Mr. S. MULLER of Utrecht is the first, whose "Schetsen uit de Middeleeuwen" (Sketches on mediaeval history) (Amst. 1900) have a more general character.

On the whole the study of history is limited to that of our own country in all directions; that of universal history is chiefly confined to the history of the foreign politics of the Republic. Great influence was exercised on this by the systematic research in foreign archives, begun by BLOK with Government support in 1886 and continued by others, in the hope of discovering possible sources for Netherlands history. The Netherlands Historical Institution, established at Rome in 1904, is one of the important results of these investigations.

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NUMBER XVI.

SCIENCE

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